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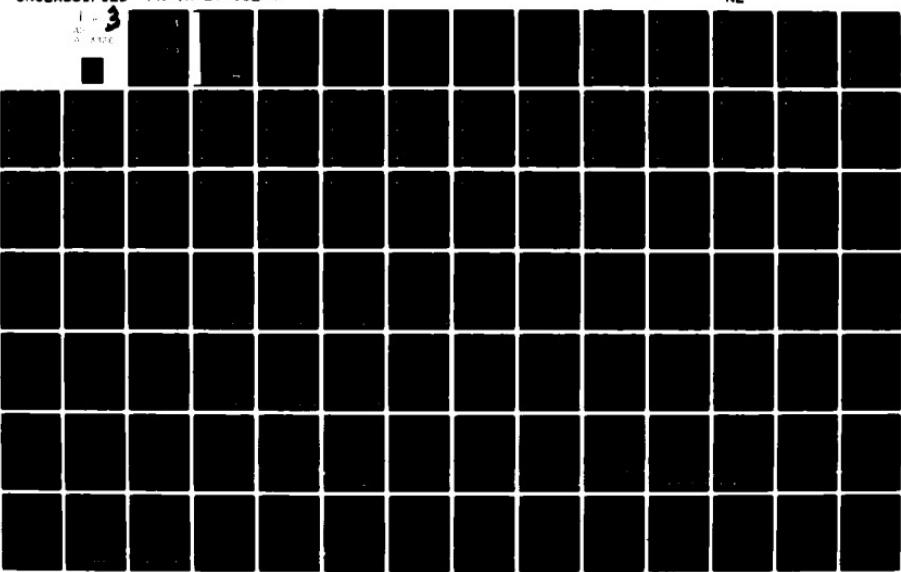
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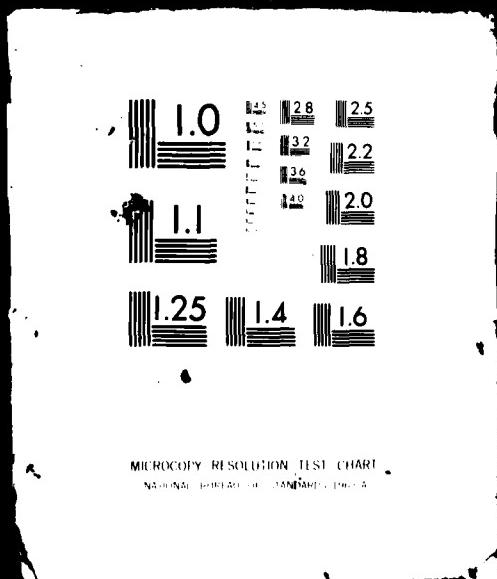
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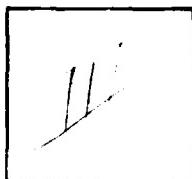
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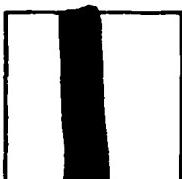
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FN-TR-27, Vol. IV Final

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24 Aug. '79

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**MX SITING INVESTIGATION  
GEOTECHNICAL EVALUATION**

**AD A113326**

**VOLUME IV  
NEVADA-UTAH  
VERIFICATION STUDIES, FY 79  
GEOTECHNICAL DATA,  
HAMLIN CDP, NEVADA**

**PREPARED FOR  
SPACE AND MISSILE SYSTEMS ORGANIZATION (SAMSO)  
NORTON AIR FORCE BASE, CALIFORNIA**



FN-TR-27-IV

MX SITING INVESTIGATION  
GEOTECHNICAL EVALUATION  
VOLUME IV, NEVADA-UTAH  
VERIFICATION STUDIES, FY 79  
GEOTECHNICAL DATA  
HAMLIN CDP, NEVADA

Prepared for:

U. S. Department of the Air Force  
Space and Missile Systems Organization (SAMSO)  
Norton Air Force Base, California 92409

Prepared by:

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24 August 1979

-FUGRO NATIONAL, INC.

## SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) <b>The objectives of this report was to verify sufficient suitable areas for deployment of the MX System &amp; to provide preliminary physical &amp; engineering characteristics of the soils. The basic data consisting of boring and trench logs, seismic refraction surveys, sieve analyses, soil, electrical resistivity, depth to water, depth to rock.</b>		

VOLUME IV  
GEOTECHNICAL DATA, HAMLIN CDP

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- 1 ACTIVITY LOCATION MAP
- 2 CONE PENETROMETER TEST RESULTS

## FOREWORD

This report was prepared for the Department of the Air Force, Space and Missile Systems Organization (SAMSO), in compliance with Contract No. F04704-78-C-0027, CDRL Item 005A2. It presents geological, geophysical, and geotechnical data and evaluates the suitability of portions of Nevada and Utah for siting the MX Land Mobile Advanced ICBM System.

This report is the first of several Verification reports which will be prepared. The objectives are to verify sufficient suitable area for deployment of the MX System and to provide preliminary physical and engineering characteristics of the soils. The Verification Studies are the final phase of a site-selection process which was begun in 1977. Previous studies have been termed Screening, Characterization, and Ranking. In preparing this report, it has been assumed that the reader is familiar with these previous studies.

Results of the FY 79 Verification studies are contained in 11 volumes as follows:

### Geotechnical Results

Volume 1A - Sections 1.0, 2.0, and 3.0 contain Introduction, Results and Conclusions, and Recommendations for Future Studies. Sections 4.0 through 6.0 contain summary geotechnical data for Whirlwind, Snake East, and Hamlin CDP's.

Volume 1B - Sections 7.0 through 10.0 contain summary geotechnical data for White River North, Garden-Coal, Reveille-Railroad and Big Smoky CDP's.

### Geotechnical Data Volumes

- Volume II - Whirlwind CDP
- Volume III - Snake East CDP
- \* Volume IV - Hamlin CDP
- Volume V - White River North CDP
- Volume VI - Garden-Coal CDP
- Volume VII - Reveille-Railroad CDP
- Volume VIII - Big Smoky CDP
- Volume IX - Dry Lake CDP
- Volume X - Ralston CDP

\* This volume is presented herein.

**SECTION 1.0**  
**GEOLOGIC STATION DATA**

EXPLANATIONS OF GEOLOGIC STATION DATA

Geologic stations were established at selected locations throughout the CDP at which detailed descriptions of surficial basin-fill deposits or rock were recorded. Locations of all geologic stations are shown in Drawing 1, Activity Location Map. All data taken on surficial basin-fill units at these stations are listed in Table 1-1 and an explanation of the column headings in the table is given below. At stations where rock descriptions were made, only geologic unit designations are listed. A general explanation of all geologic unit symbols used in Verification Studies is included at the end of this section.

<u>Column Heading Table 1-1</u>	<u>Explanation</u>
Station Number	Geologic stations are numbered sequentially. Where more than one geologic field team worked in a CDP, stations made by each team are differentiated with a letter (A, B, or C) following the station number.
Geologic Unit	Generic geologic unit only, i.e. the grain-size designation (f, s, g, c) is omitted from surficial basin-fill units. The letter B in the unit designation indicates a buried deposit not exposed at the surface.
MPS MM	Average maximum particle size in millimeters.
Grain Size (%B, %C, %G, %S, %F)	Estimated particle size distribution using the Unified Soil Classification System. Percentages of boulders (%B) and cobbles (%C) are based on the entire deposit, whereas percentages of gravel (%G), sand (%S) and fines (%F) are taken only on the fraction composed of particles less than 3 inches (76 mm) in diameter.
USCS	Soil class according to the Unified Soil Classification System.

Munsell Color	Soil color based on Munsell Soil Color Chart.
Source Rock Types(s)	Rock types of coarse clasts listed in order of abundance.
* Physical Properties	Data listed in columns 6 through 15 address specific soil properties. These are listed below in parentheses following the column heading number and are also listed at the bottom of Table 1-1. Data are coded with each numerical entry referring to a specific soil condition as listed below.
6 (Grain Shape)	1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well rounded
7 (Moisture Content)	1) Dry, 2) Moist, 3) Wet
8 (Plasticity of Fines)	1) None, 2) Low, 3) Medium, 4) High
9 (Consistency)	Coarse grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense, Fine grained: 1) Soft, 2) Firm, 3) Stiff, 4) Hard
10 (Structure)	1) Stratified Tabular, 2) Stratified Other (lensed, cross bedded, discontinuous beds), 3) Nonstratified
11 (Cementation Induration)	1) None, 2) Weak, 3) Moderate, 4) Strong
12 (Depth to Cemented Layers)	Depth to layer (in centimeters) exhibiting cementation induration described in Column 11 (above)
13 (Weathering of clasts)	1) Fresh, 2) Slight, 3) Moderate, 4) Very
14 (Soil Profile Development)	1) None (A-C profile), 2) Poor (incipient B-horizon), 3) Well (prominent B-horizon)
15 (Caliche Development)	1) Stage I, 2) Stage II, 3) Stage III, 4) Stage IV, 5) None

**Drainage**

DP (M)	Average depth of drainages (in meters)
WD (M)	Average width of drainages (in meters)
Slope (%)	Average slope of ground surface (in percent grade)
Sample	Number of samples taken

GENERALIZED GEOLOGIC UNITSExplanation

## Surficial Basin-fill Units

- A1 Younger Fluvial Deposits - Major modern stream channel and flood-plain deposits.
- A2 Older Fluvial Deposits - Older incised stream channel and flood-plain deposits in elevated terraces bordering major modern drainages.
- A3 Eolian Deposits - Wind-blown deposits of sand occurring as either thin sheets (A3s) or dunes (A3d).
- A4 Playa and Lacustrine Deposits - Deposits occurring in modern, active playas (A4) or in either inactive playas or older lake beds and abandoned shorelines associated with extinct lakes (A4o).
- A5 Alluvial Fan Deposits - Alluvial deposits consisting of debris flow and water-laid alluvium near mountain fronts, grading into predominantly water-laid alluvium deposited in shifting distributary channels near the basin center. Younger (A5y), intermediate (A5i), and older (A5o) alluvial fans are differentiated by surface soil development, terrain conditions, and present depositional/erosional environment.

Grain sizes of these deposits (except A3 deposits, which are exclusively sandy) are indicated by a single letter (f, s, g, or c) following the geologic unit symbol. These letters indicate the predominant grain size and range of soil types according to the Unified Soil Classification System:

f - fine-grained (ML, CL, MH, CH)

s - sands (SP, SW, SM, SC)

g - gravels (GP, GW, GM, GC)

c - coarse grained with greater than 30 percent boulders and cobbles (generally GP, GW, GM, GC)

ROCK UNITS

- I Igneous (undifferentiated). Rocks formed by solidification of a molten or partially molten mass.
- II Intrusive - Plutonic rocks formed by solidification of molten material beneath the surface (e.g., granite, granodiorite, diorite, gabbro).
- I2 Extrusive (intermediate and acidic) - Volcanic rocks of intermediate and acidic composition formed by solidification of molten material at or near the surface, (e.g., rhyolite, latite, dacite, andesite).
- I3 Extrusive (basic) - Volcanic rocks of basic composition, generally formed by solidification of molten materials at or near the surface (e.g., basalt).
- I4 Extrusive (pyroclastic) - Rocks formed by accumulation of volcanic ejecta (e.g., ash, tuff, welded tuff, agglomerate).
- S Sedimentary (undifferentiated) - Rocks formed by accumulation of clastic solids, organic solids and/or chemically precipitated minerals.
- S1 Arenaceous and/or Siliceous Rocks - Composed of sand size particles (e.g., sandstone, orthoquartzite) or of cryptocrystalline silica (e.g., opal, chert).
- S2 Carbonate Rocks - Composed predominantly of calcium carbonate detritus or chemical precipitates (e.g., limestone, dolomite, chalk).
- S3 Argillaceous Rocks - Composed of clay and silt-sized particles (e.g., siltstone, shale, claystone).
- S4 Evaporite Rocks - Precipitated from solution as a result of evaporation (e.g., halite, gypsum, anhydrite, sylvite).
- S5 Coarse Clastic Rocks - Composed of gravel sized or larger clasts (e.g., conglomerate, breccia).
- M Metamorphic (undifferentiated) - Rocks formed through recrystallization in the solid state of preexisting rocks by heat and pressure (e.g., gneiss, schist, hornfels, metaquartzite).



**SECTION 2.0**  
**GROUND-WATER DATA**

#### EXPLANATIONS OF GROUND-WATER DATA

Existing ground-water data were collected from all available sources. These data were updated where possible from measurements taken during Fugro field operations, and all data are shown on Table 2-1. Locations of water wells and boreholes in which water-level measurements were available are shown in Drawing 1. Well numbers listed in Column 1 (Table 2-1) refer to well locations in Drawing 1. Actual well numbers giving location according to the Bureau of Land Management Land Survey System are shown in Column 2.

Water levels generally refer to the static ground-water table in the unconfined basin-fill aquifer. Perched conditions or levels in artesian aquifers are noted where known.

WELL NO.	WELL LOCATION NUMBER* (Nevada)	ELEVATION OF GROUND SURFACE - FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL - FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE - FEET (METERS)	DATE MEASURED	ELEVATION - FEET (METERS) ABOVE M.S.L.	
W1	14N/69E-24a	5680 (1731)	70 (21)	27 (8)	1958	5653 (1723)	1
W2	14N/70E-31c	5620 (1713)	65 (20)	25 (8)	1950	5595 (1705)	1
W3	13N/69E-11a	6300 (1920)	29 (9)	25 (8)	1958	6270 (1911)	1
W4	13N/70E-4d	5300 (1615)	153 (47)	44 (13)	1952	5256 (1602)	1
W5	13N/70E-9b	5350 (1631)	88 (27)	18 (5)	1958	5332 (1625)	1
W6	13N/70E-9c	5350 (1631)	84 (26)	51 (16)	1952	5299 (1615)	1
W7	13N/70E-10a	5220 (1591)	104 (32)	flowing	1948	--	1
W8	13N/70E-14cl	5200 (1585)	415 (126)	flowing	1949	--	1, flow 20gpm
W9	13N/70E-16cl	5400 (1646)	153 (47)	39 (12)	1953	5361 (1634)	1
W10	13N/70E-35al	5330 (1625)	158 (48)	100 (30)	1947	5230 (1594)	1
W11	10N/70E-11dl	5500 (1676)	100 (30)	9 (3)	1953	5400 (1646)	1
W12	10N/70E-12bl	5490 (1673)	80 (24)	14 (4)	1953	5476 (1669)	1
W13	10N/70E-25dl	5535 (1687)	70 (21)	7 (2)	1953	5528 (1685)	1
W14	9N/70E-34dl	5640 (1719)	217 (66)	109 (33)	1947	5531 (1686)	1
W15	8N/69E-15bl	5730 (1747)	110 (34)	77 (23)	1964	5653 (1723)	1
W16	8N/69E-36al	5760 (1756)	225 (69)	153 (47)	1947	5607 (1709)	1
W17	8N/70E-66l	5670 (1728)	164 (50)	92 (28)	1947	5578 (1700)	1

\*Mt. Diablo Baseline and Meridian

\*\*References:

1. Hood and Rush (1966)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA  
VERIFICATION SITE  
HAMILIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE  
2-1  
1 OF 3

FUGRO NATIONAL, INC.

WELL NO.	WELL LOCATION NUMBER* (Nevada)	ELEVATION OF GROUND SURFACE - FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL - FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE - FEET (METERS)	DATE MEASURED	ELEVATION - FEET (METERS) ABOVE M.S.L.	
W18	8N/70E-21a1	5710 (1740)	153 (47)	128 (39)	1964	5582 (1701)	

GROUND-WATER DATA  
VERIFICATION SITE  
HAMLIN CDP, NEVADA

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE  
2-1  
2 OF 3

FUGRO NATIONAL, INC.

WELL NO.	WELL LOCATION NUMBER* (Utah)	ELEVATION OF GROUND SURFACE- FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL- FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE- FEET (METERS)	DATE MEASURED	ELEVATION- FEET (METERS) ABOVE M.S.L.	
W19	22S/19W-6bacl	5250 (1600)	167 (51)	49 (15)	1950	5201 (1585)	1
W20	23S/19W-9cdbl	5405 (1647)	270 (82)	15 (5)	1936	5390 (1643)	1
W21	23S/19W-13aab	5930 (1807)	540 (165)	476 (145)	--	5454 (1662)	1
W22	23S/19W-20bacl	5410 (1649)	40 (12)	15 (5)	1950	5395 (1644)	1
W23	23S/19W-24dcc	5780 (1762)	472 (144)	455 (139)	1939	5325 (1623)	1
W24	23S/19W-32a	--	-	200-250 (61-76)	--	--	2
W25	24S/19W-3db	5558 (1694)	172 (52)	138 (42)	--	5420 (1652)	1
W26	30S/19W-21cab	6325 (1928)	215 (66)	170 (52)	--	6155 (1876)	1
W27	32S/19W-10bba	6700 (2042)	-	flowing	1962	--	1, flow-2gpm
W28	32S/19W-21abal	6800 (2073)	38 (12)	17 (5)	1962	6783 (2067)	1
W29	32S/19W-21aba2	6800 (2073)	61 (19)	58 (18)	1962	6742 (2055)	1
W30	32S/19W-22ddb	6800 (2073)	407 (124)	335 (102)	1964	6465 (1970)	1
W31	32S/19W-25aaa	--	40 (12)	dry	--	--	1

\*Salt Lake Baseline and Meridian

## \*\*References:

1. Hood and Rush (1966)
2. Snyder (1963)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA  
VERIFICATION SITE  
HAMLIN CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE  
2-1  
3 OF 3

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**SECTION 3.0**  
**SEISMIC REFRACTION DATA**

EXPLANATIONS OF SEISMIC REFRACTION DATA

Each figure shows seismic wave travel times plotted versus surface distance between the energy source (shot) and the detector (geophone) for a single seismic line. Distances are measured along the line from geophone number 1 which is designated as zero distance. Distances to the right (on the paper) of geophone 1 are positive. The direction arrow gives the approximate direction of the geophone array from geophone 1 to geophone 24.

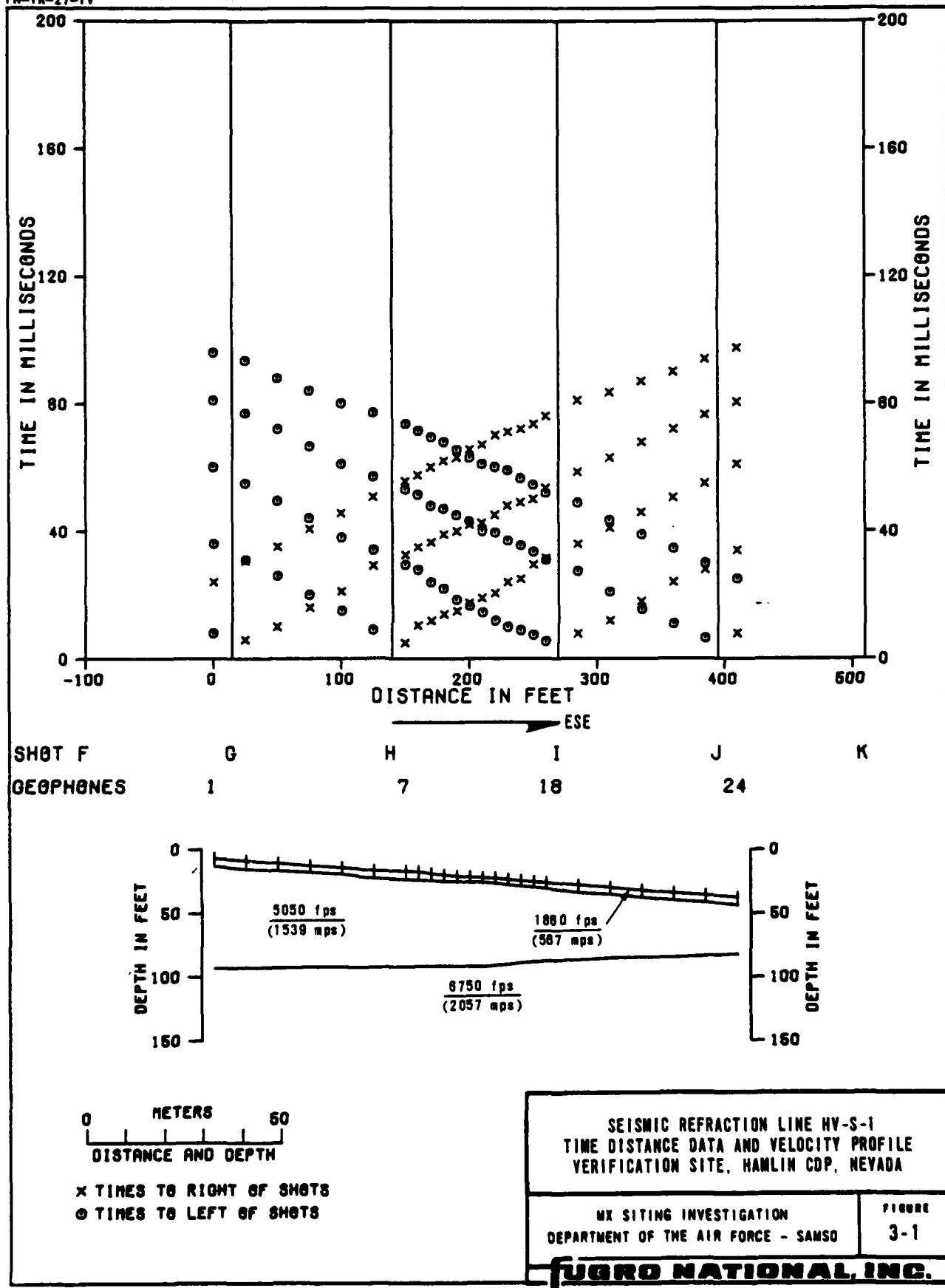
Travel Time Versus Distance Graph (Upper Half of Figure)

This is a travel time versus distance graph. The abscissa represents distance; the ordinate, time. The six vertical lines represent the locations of shots (designated as F, G, H, I, J, and K). The symbol, X, denotes travel times at geophones that were located to the right of a shot. The symbol, @, denotes travel times that were located to the left of shots.

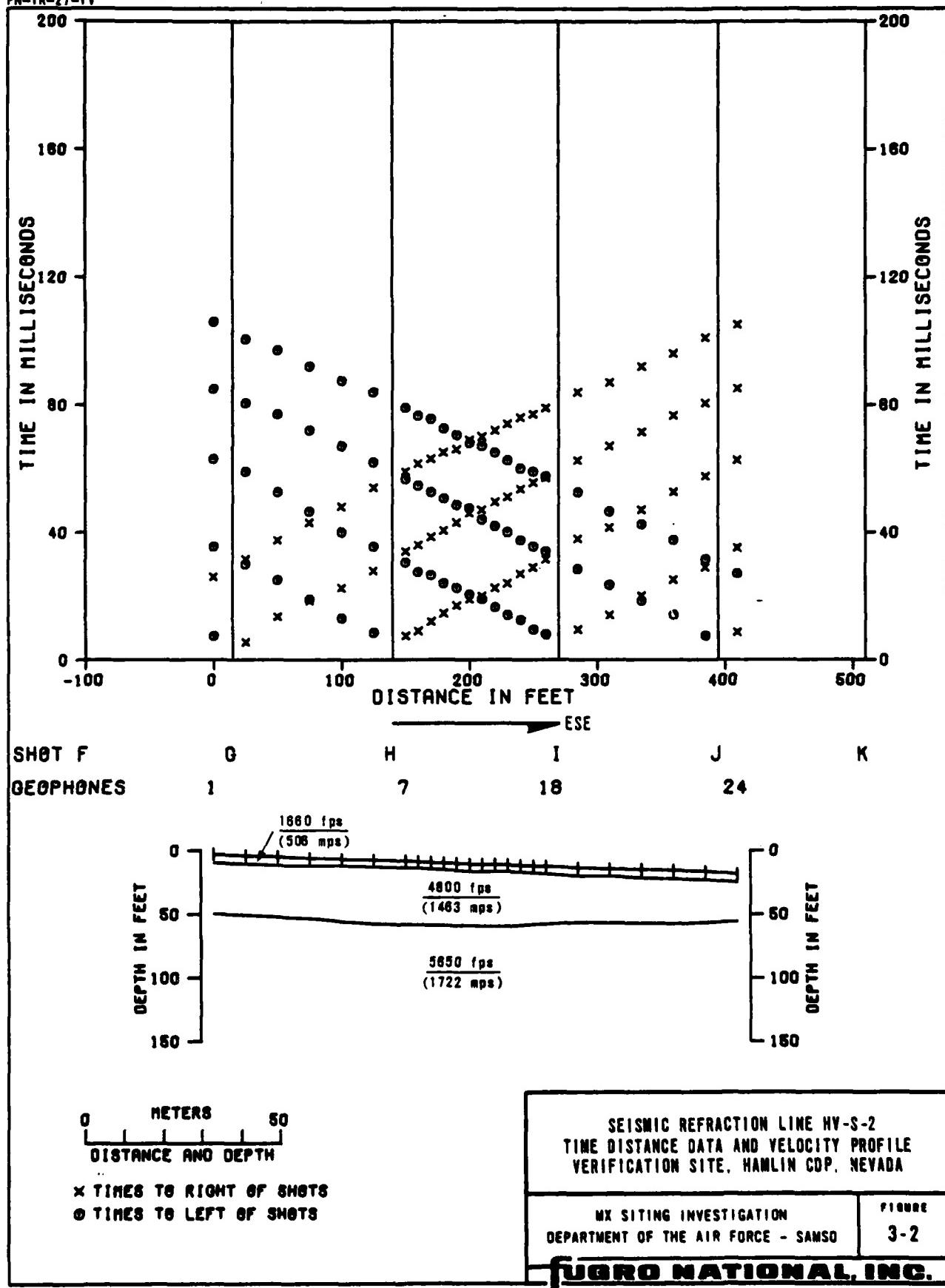
Velocity Cross Section (Lower Half of Figure)

This is an interpreted velocity cross section beneath the seismic line. The top line represents the ground-surface profile. The short vertical lines crossing the top line mark the geophone positions. The depth scale is plotted relative to a point on the line which was arbitrarily chosen as "zero elevation" at the time the line was surveyed. The additional lines across the cross section represent the interpreted boundaries between layers of material with different compressional wave velocities. These boundaries are commonly called "refractors". The velocity interpreted to be representative of each layer is shown.

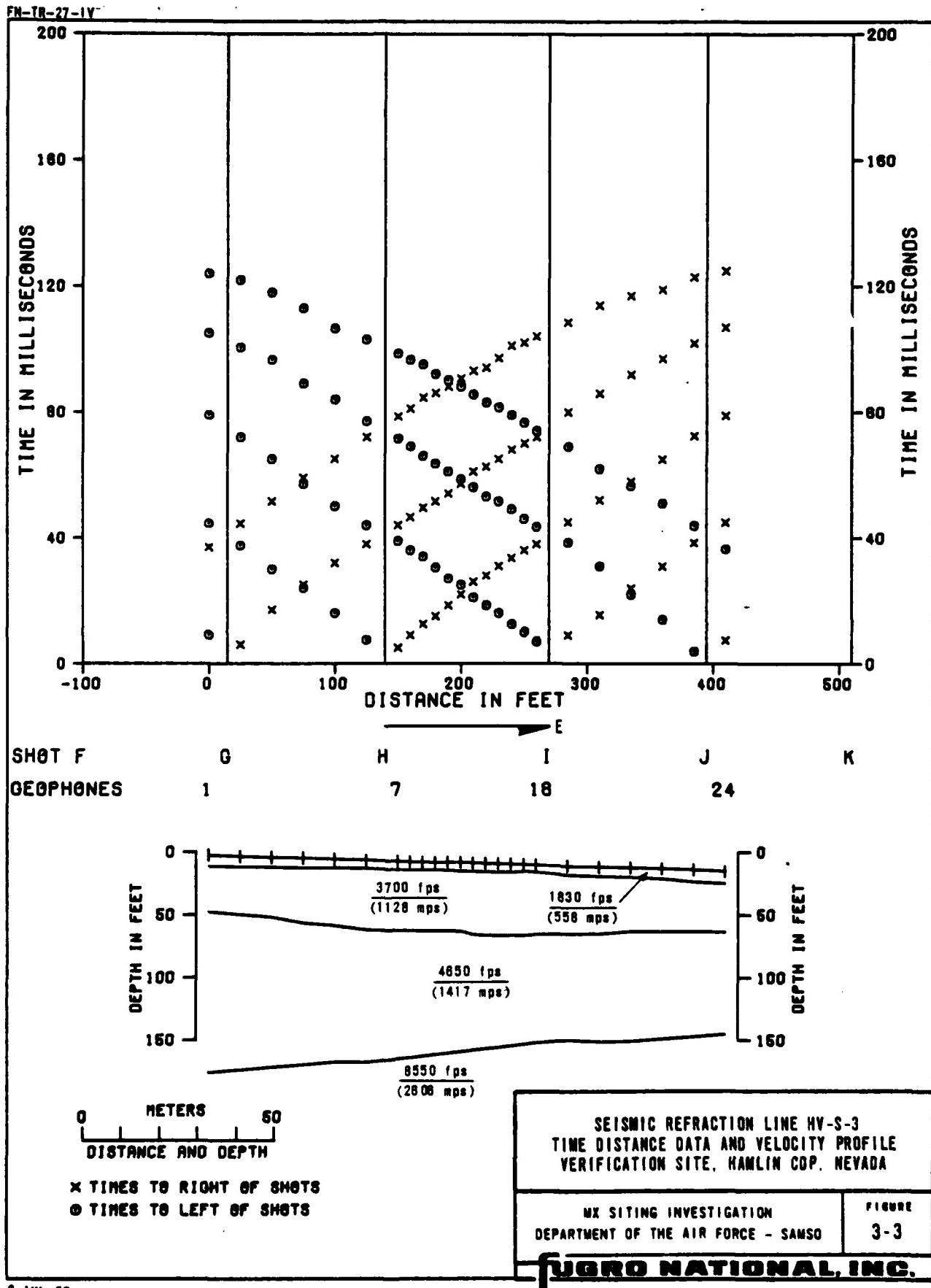
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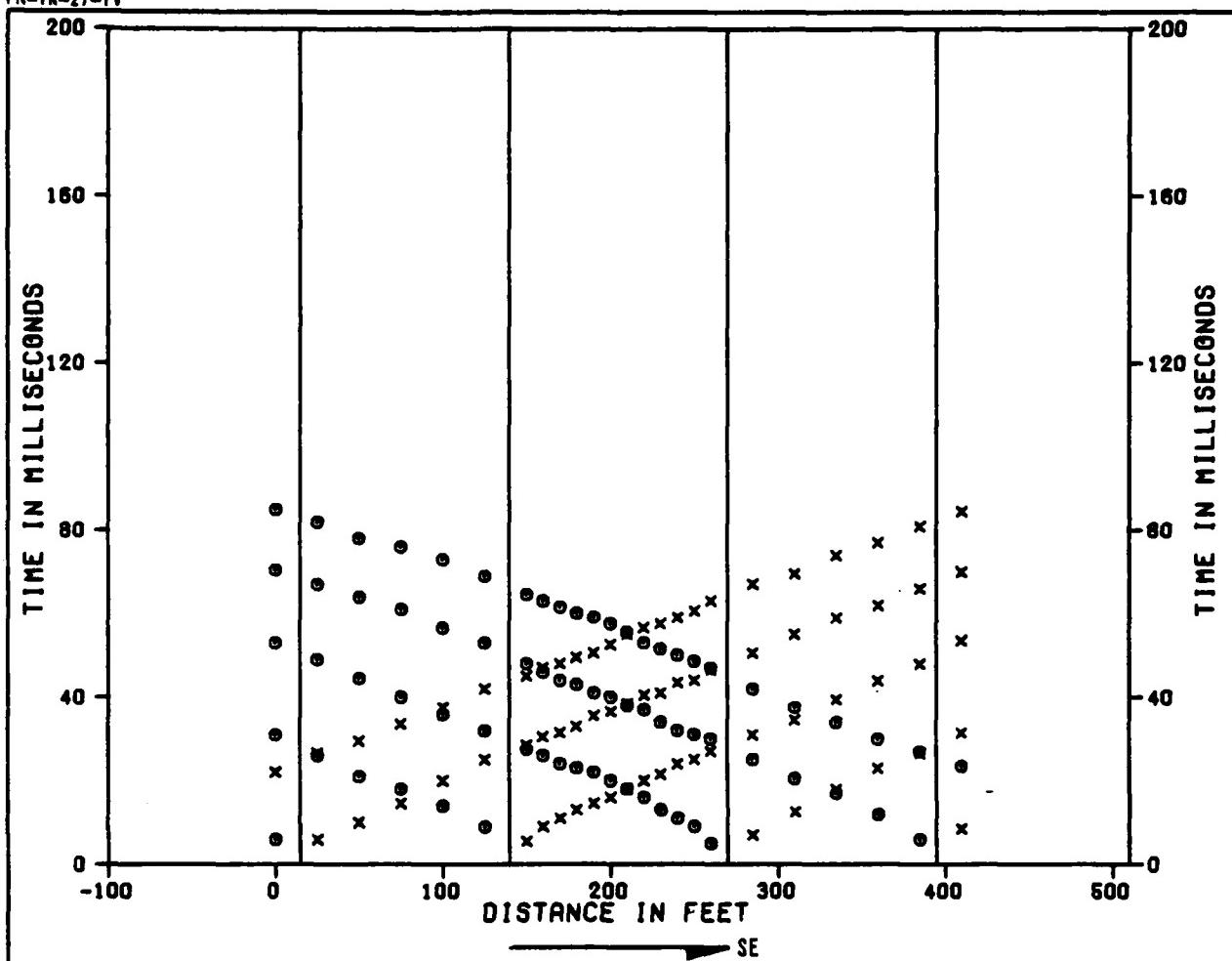


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SHOT F

G

H

I

J

K

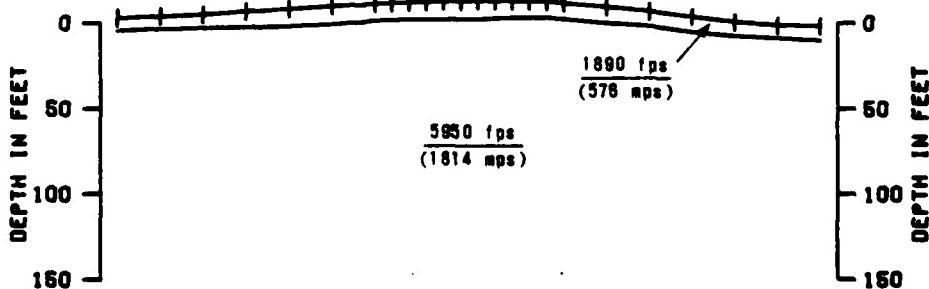
GEOPHONES

1

7

18

24



0 METERS  
DISTANCE AND DEPTH  
50

X TIMES TO RIGHT OF SHOTS  
O TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE HV-S-4  
TIME DISTANCE DATA AND VELOCITY PROFILE  
VERIFICATION SITE, HAMILTON CORP., NEVADA

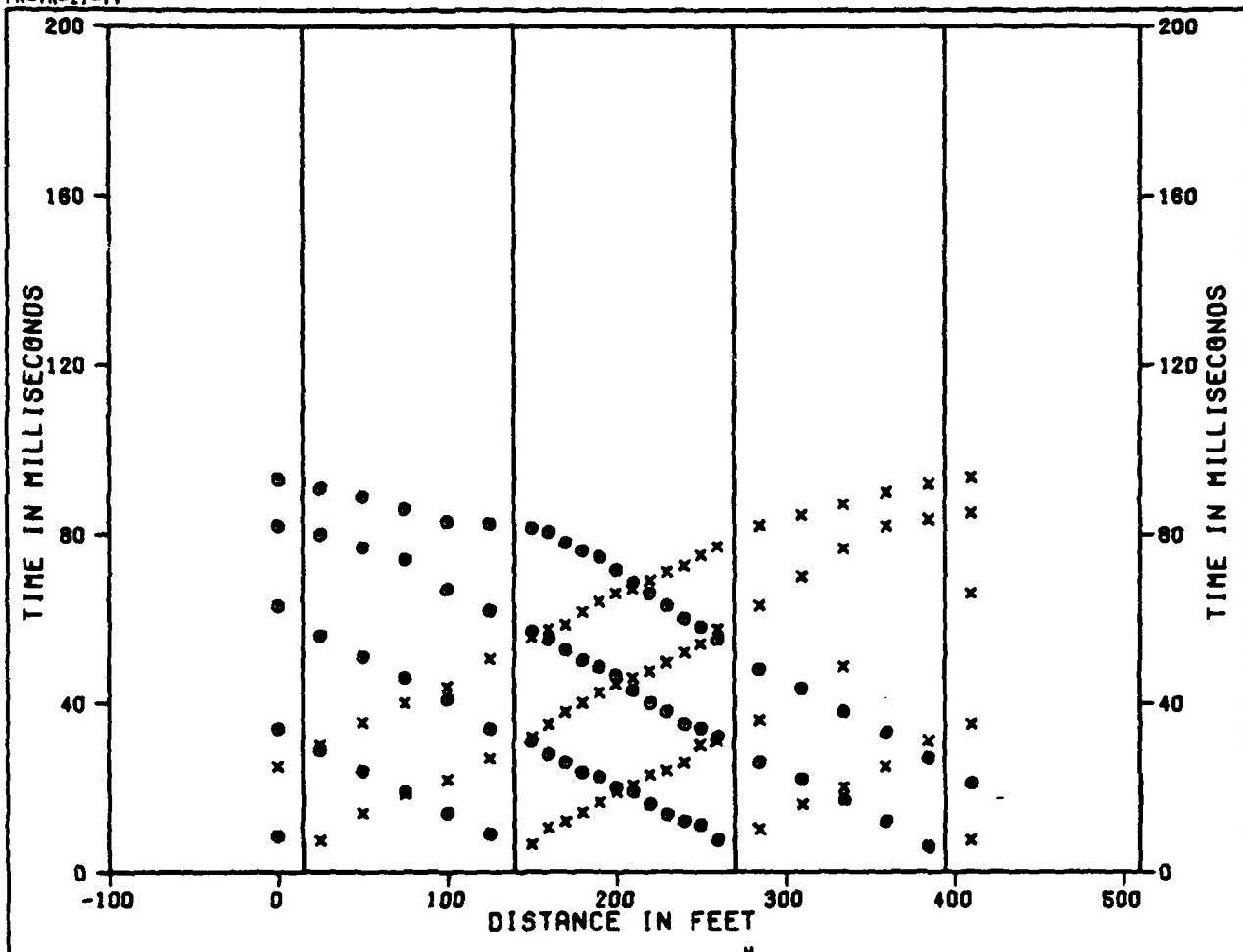
MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
3-4

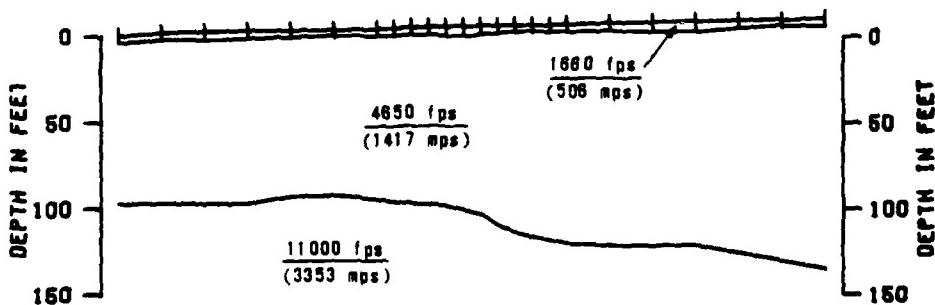
FUGRO NATIONAL, INC.

1 JUL 78

FN-TR-27-IV



SHOT F                    G                    H                    I                    J                    K  
GEOFONIES      1                    7                    18                    24



0                    METERS                    50  
DISTANCE AND DEPTH

X TIMES TO RIGHT OF SHOTS  
O TIMES TO LEFT OF SHOTS

2 JUL 78

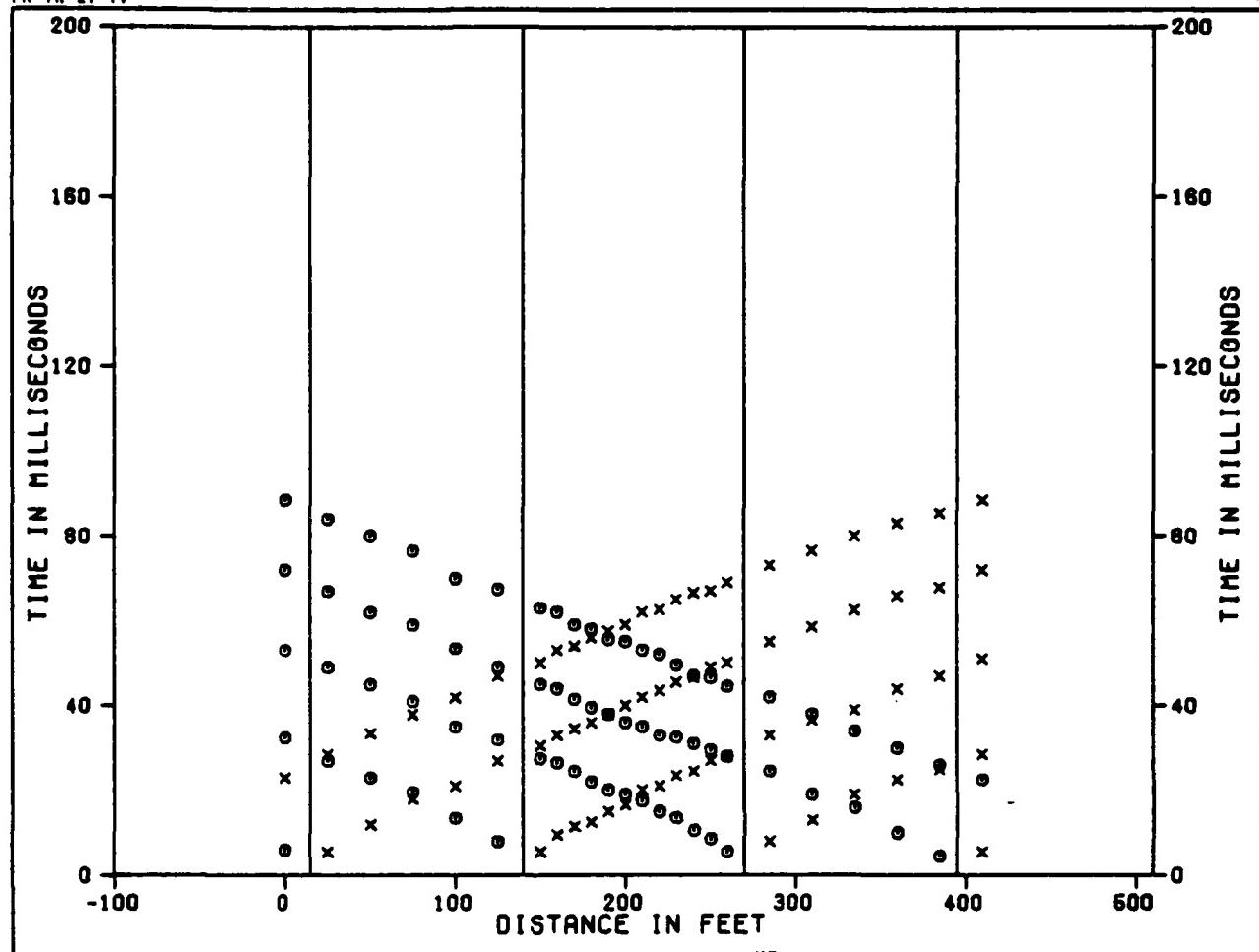
SEISMIC REFRACTION LINE HV-S-5  
TIME DISTANCE DATA AND VELOCITY PROFILE  
VERIFICATION SITE, HAMLIN COP., NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

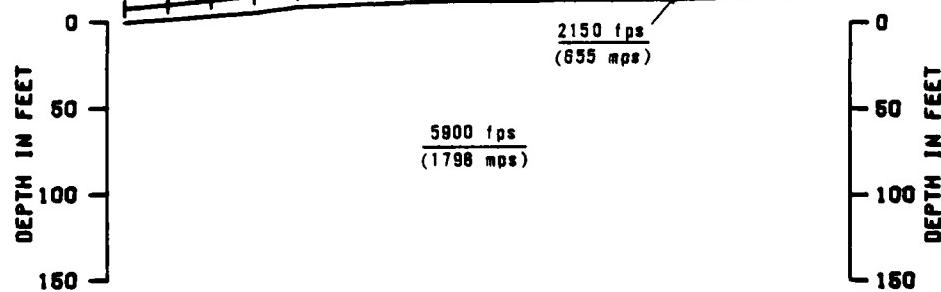
FIGURE  
3-5

FUGRO NATIONAL, INC.

FN-TR-27-IV



SHOT F                    G                    H                    I                    J                    K  
GEOFONES                1                    7                    18                    24



0                    METERS                    50  
DISTANCE AND DEPTH

X TIMES TO RIGHT OF SHOTS  
O TIMES TO LEFT OF SHOTS

2 JUL 78

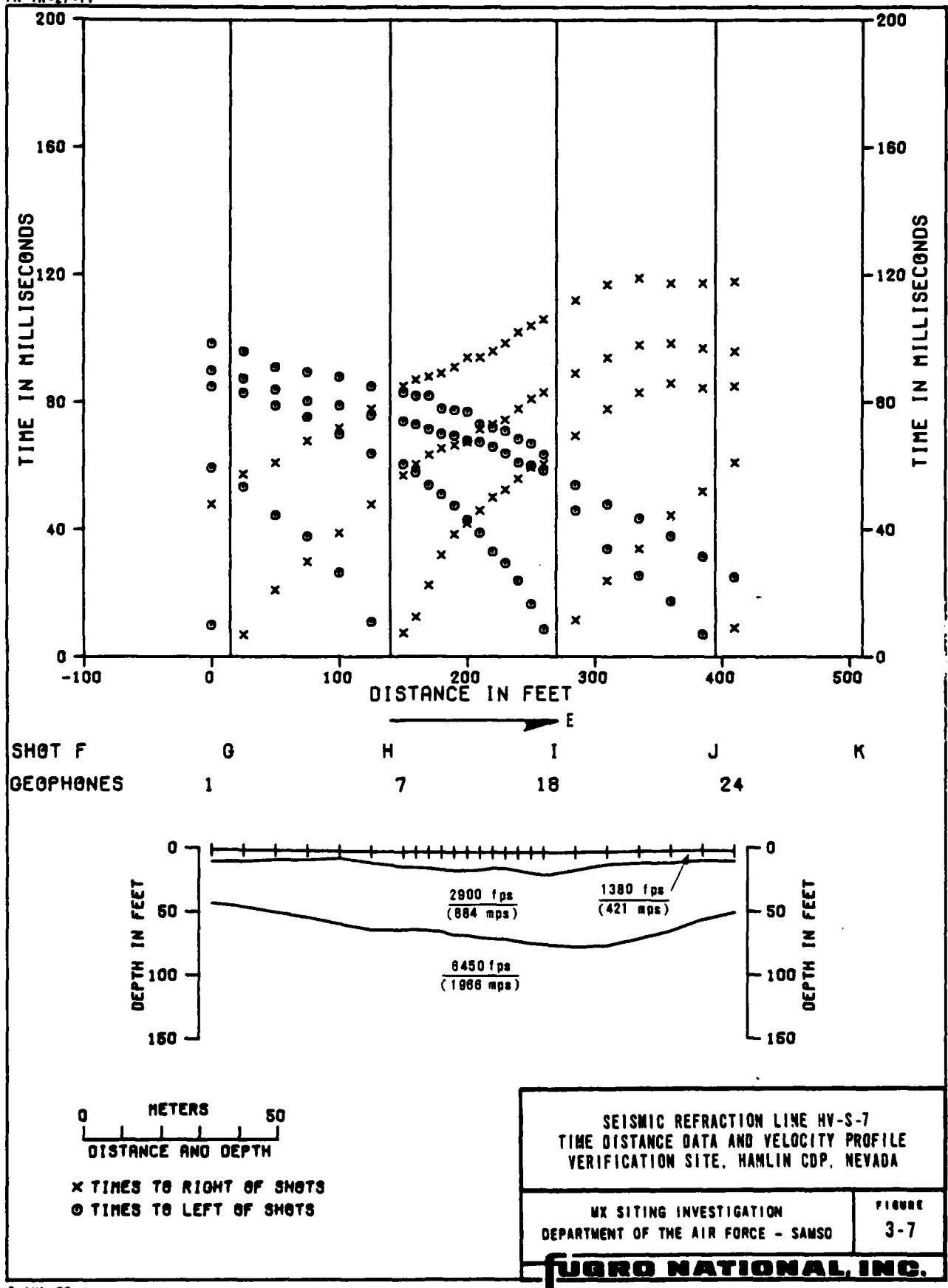
SEISMIC REFRACTION LINE HV-S-6  
TIME DISTANCE DATA AND VELOCITY PROFILE  
VERIFICATION SITE, HAMLIN CDP, NEVADA

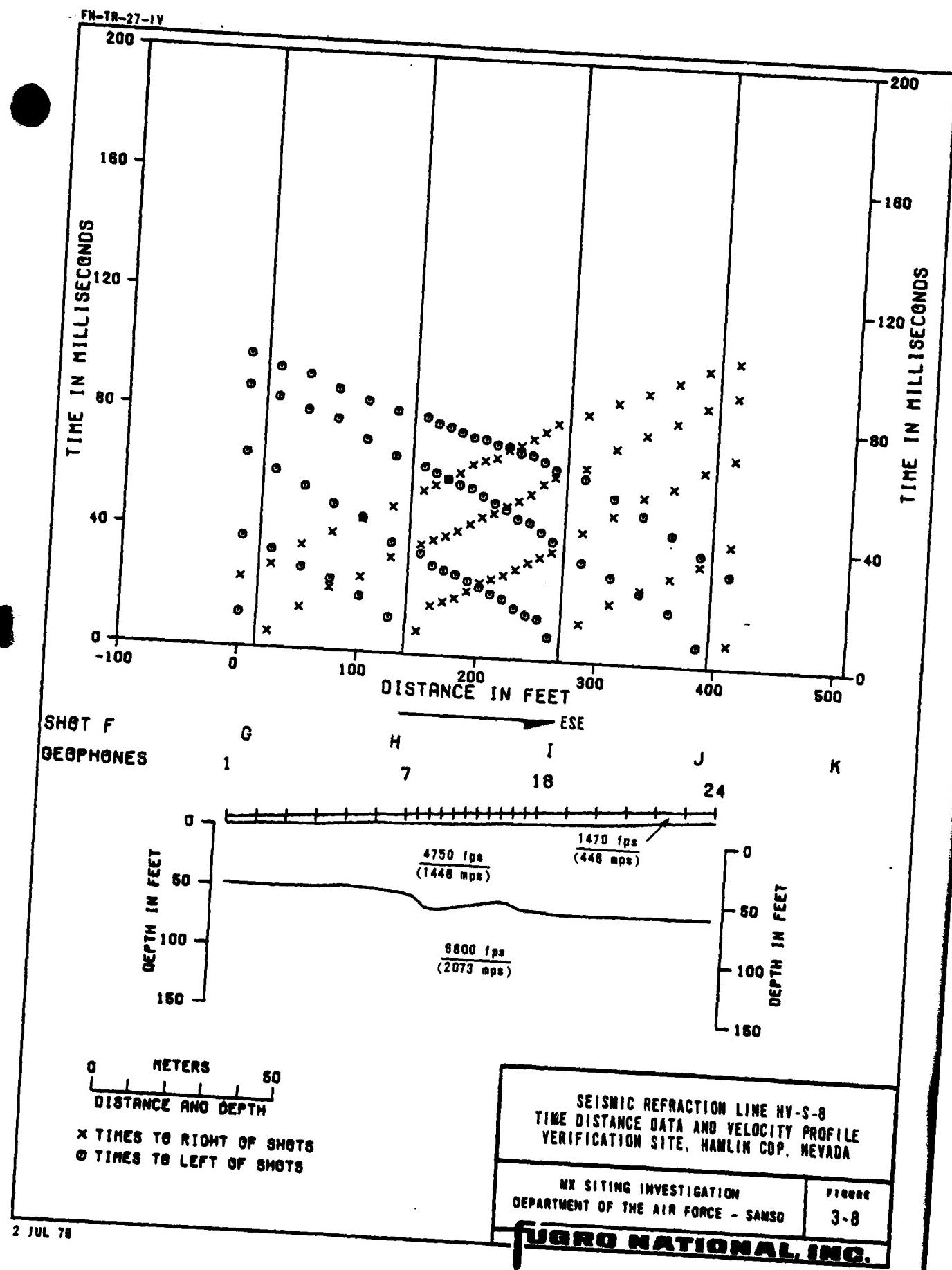
MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
3-6

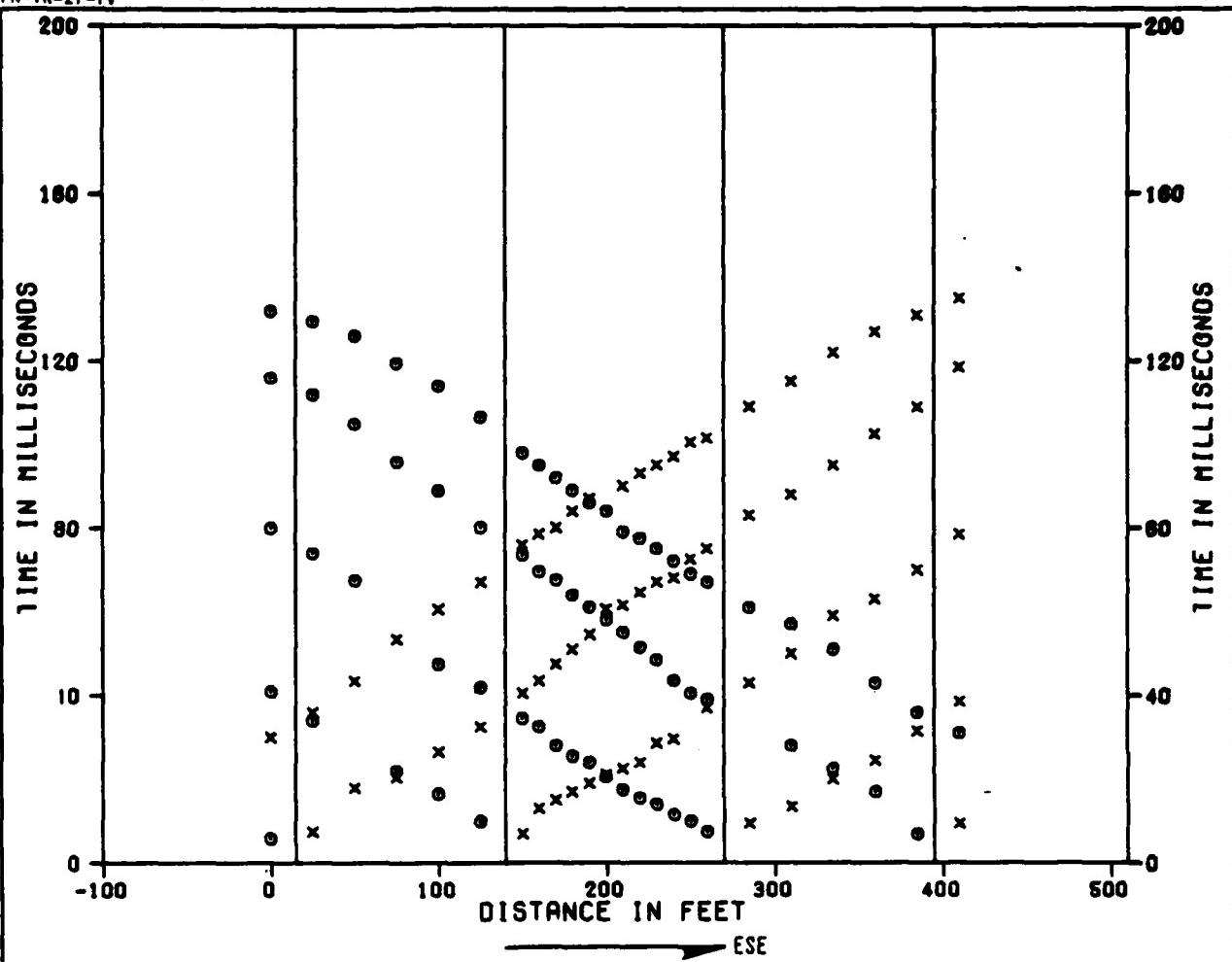
**FUGRO NATIONAL, INC.**

FN-TR-27-IV





FN-TR-27-IV



SHOT F

G

H

I

J

K

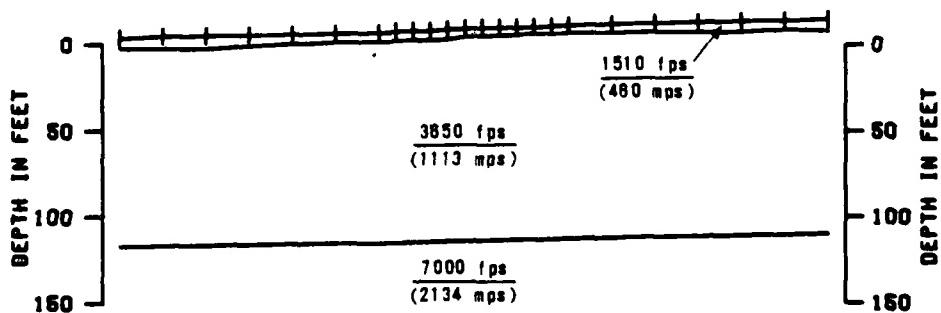
GEOFONNES

1

7

18

24



X TIMES TO RIGHT OF SHOTS  
 O TIMES TO LEFT OF SHOTS

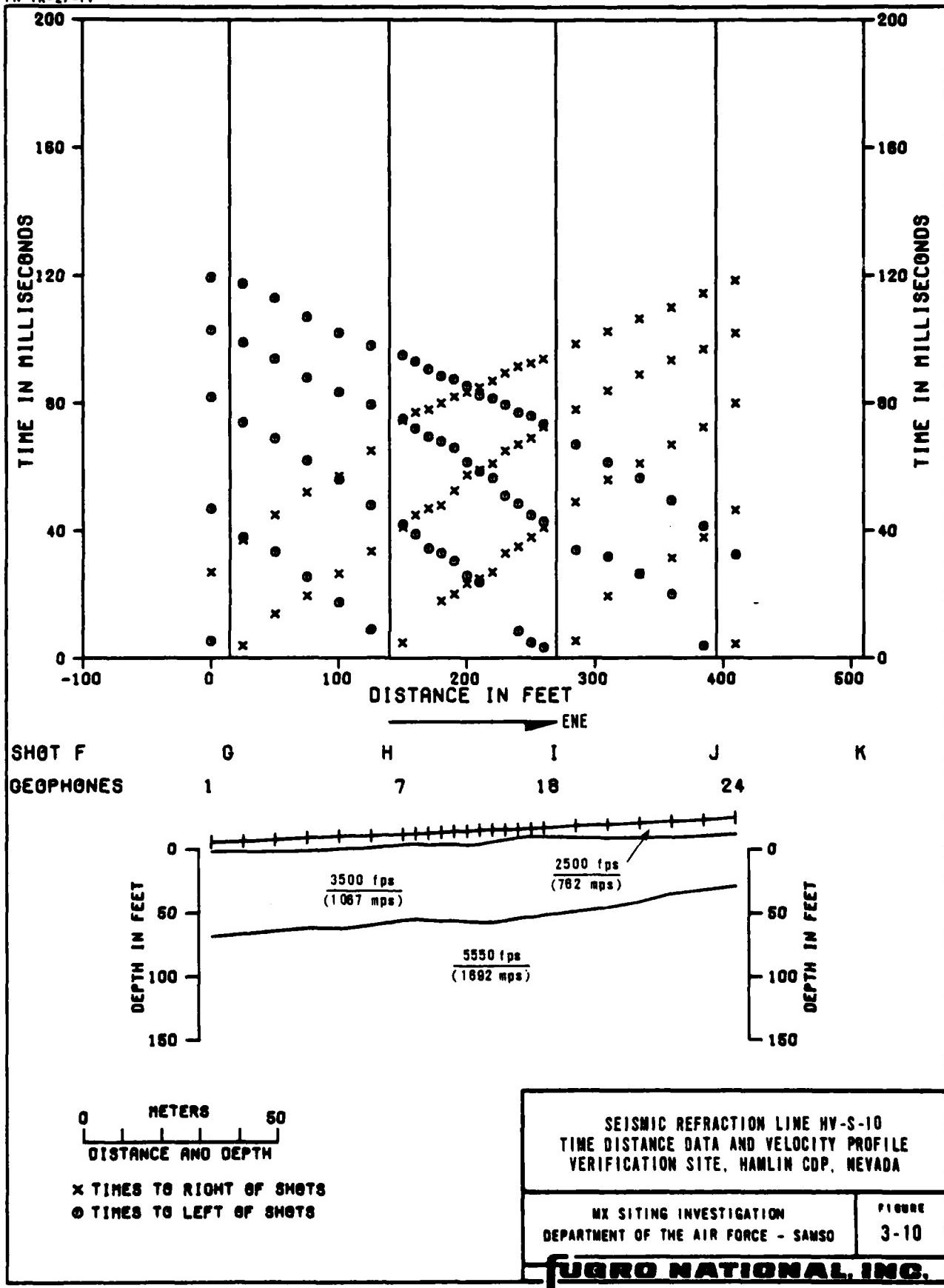
SEISMIC REFRACTION LINE HV-S-9  
 TIME DISTANCE DATA AND VELOCITY PROFILE  
 VERIFICATION SITE, HAMLIN COP, NEVADA

HV SITING INVESTIGATION  
 DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
 3-9

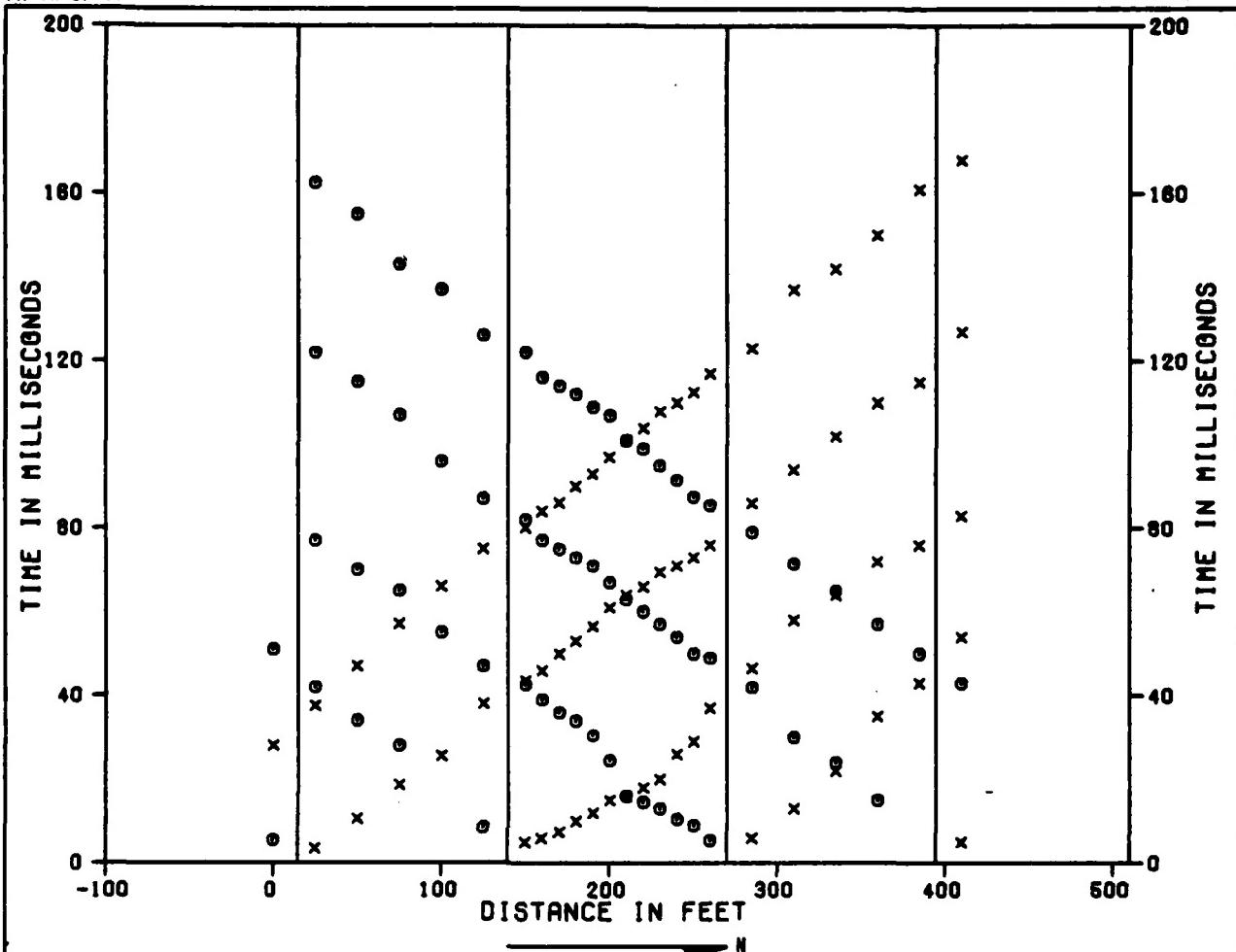
FUGRO NATIONAL, INC.

FN-TR-27-IV



2 JUL 78

FN-TR-27-IV



SHOT F

G

H

I

J

K

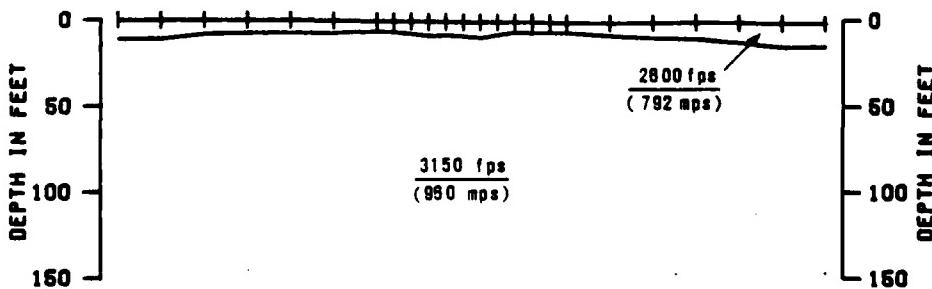
GEOPHONES

1

7

18

24



0 METERS  
DISTANCE AND DEPTH  
50

X TIMES TO RIGHT OF SHOTS  
O TIMES TO LEFT OF SHOTS

2 JUL 78

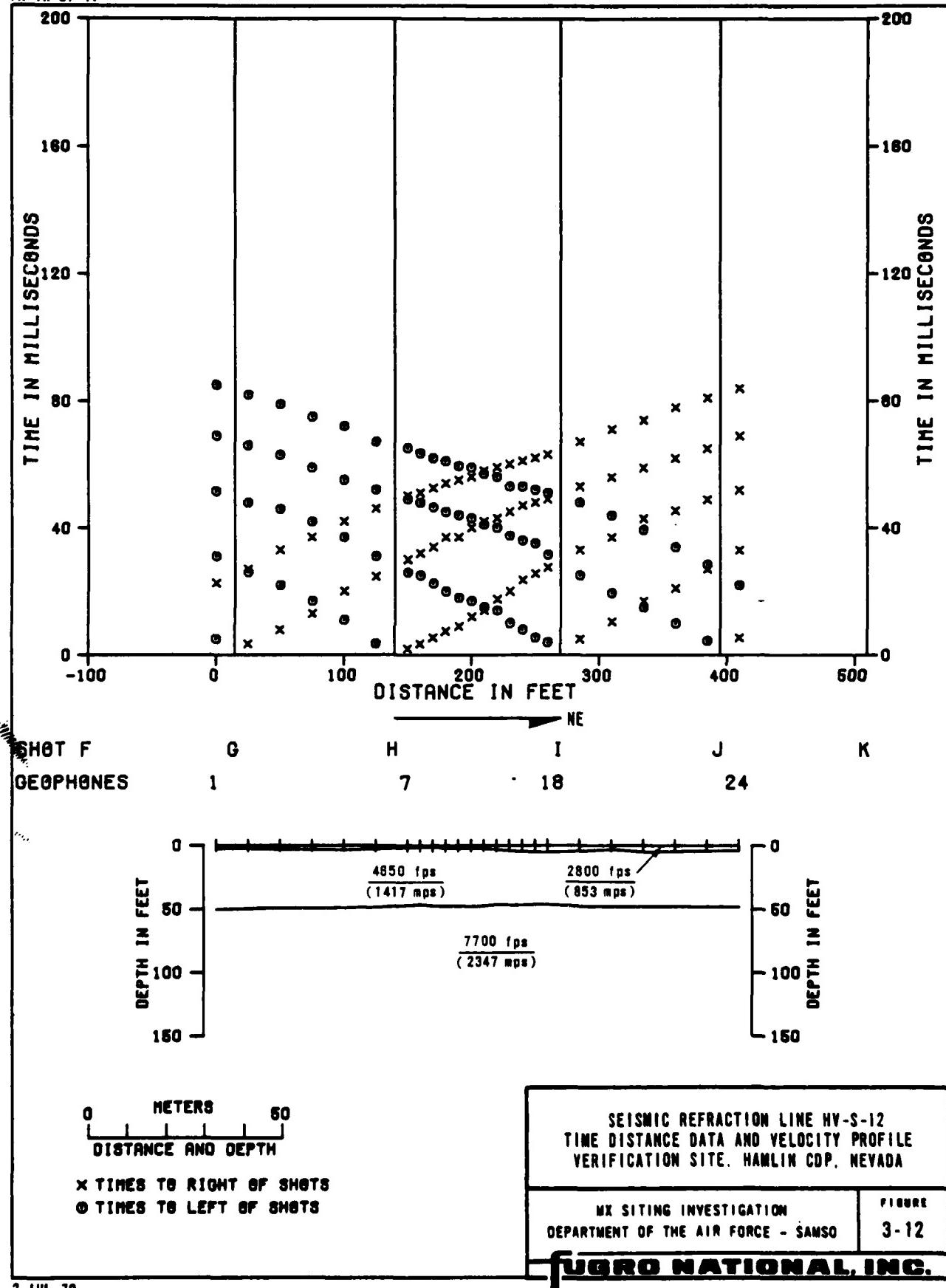
SEISMIC REFRACTION LINE HV-S-11  
TIME DISTANCE DATA AND VELOCITY PROFILE  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
3-11

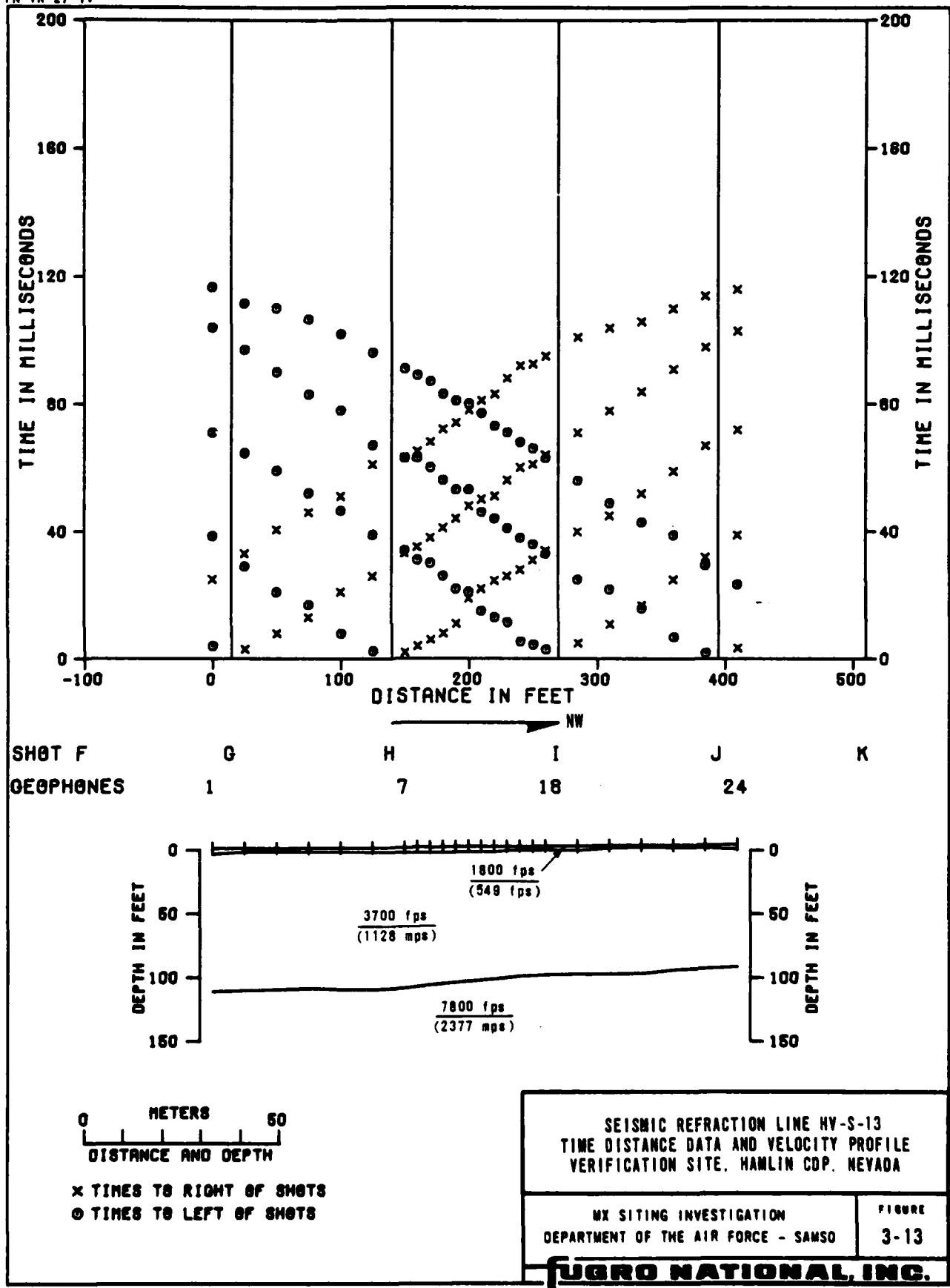
**FUGRO NATIONAL, INC.**

FN-TR-27-IV

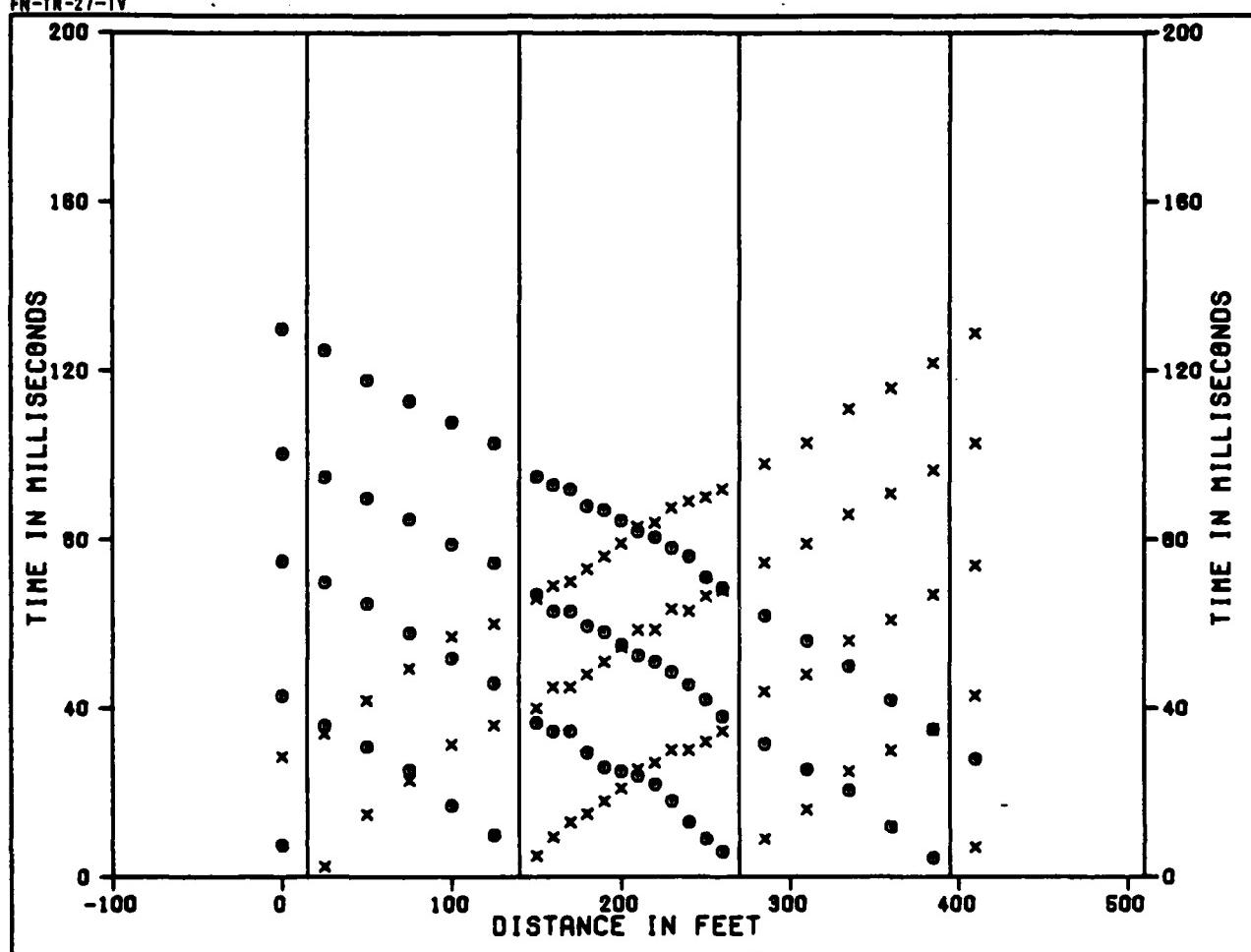


2 JUL 78

FN-TR-27-IV



FN-TR-27-IV



SHOT F

GEOFONES

0

H

I

J

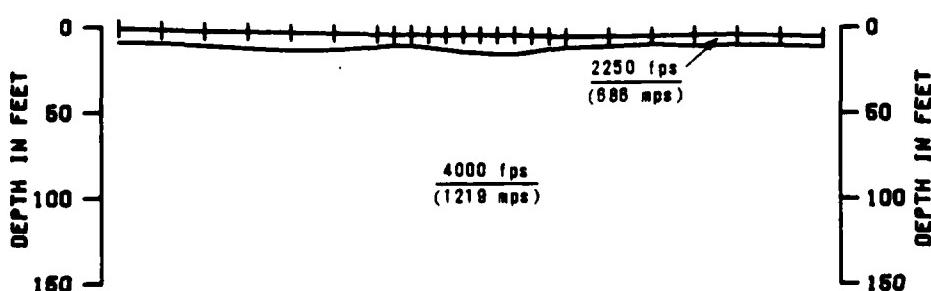
K

1

7

18

24



0 METERS  
DISTANCE AND DEPTH

X TIMES TO RIGHT OF SHOTS  
O TIMES TO LEFT OF SHOTS

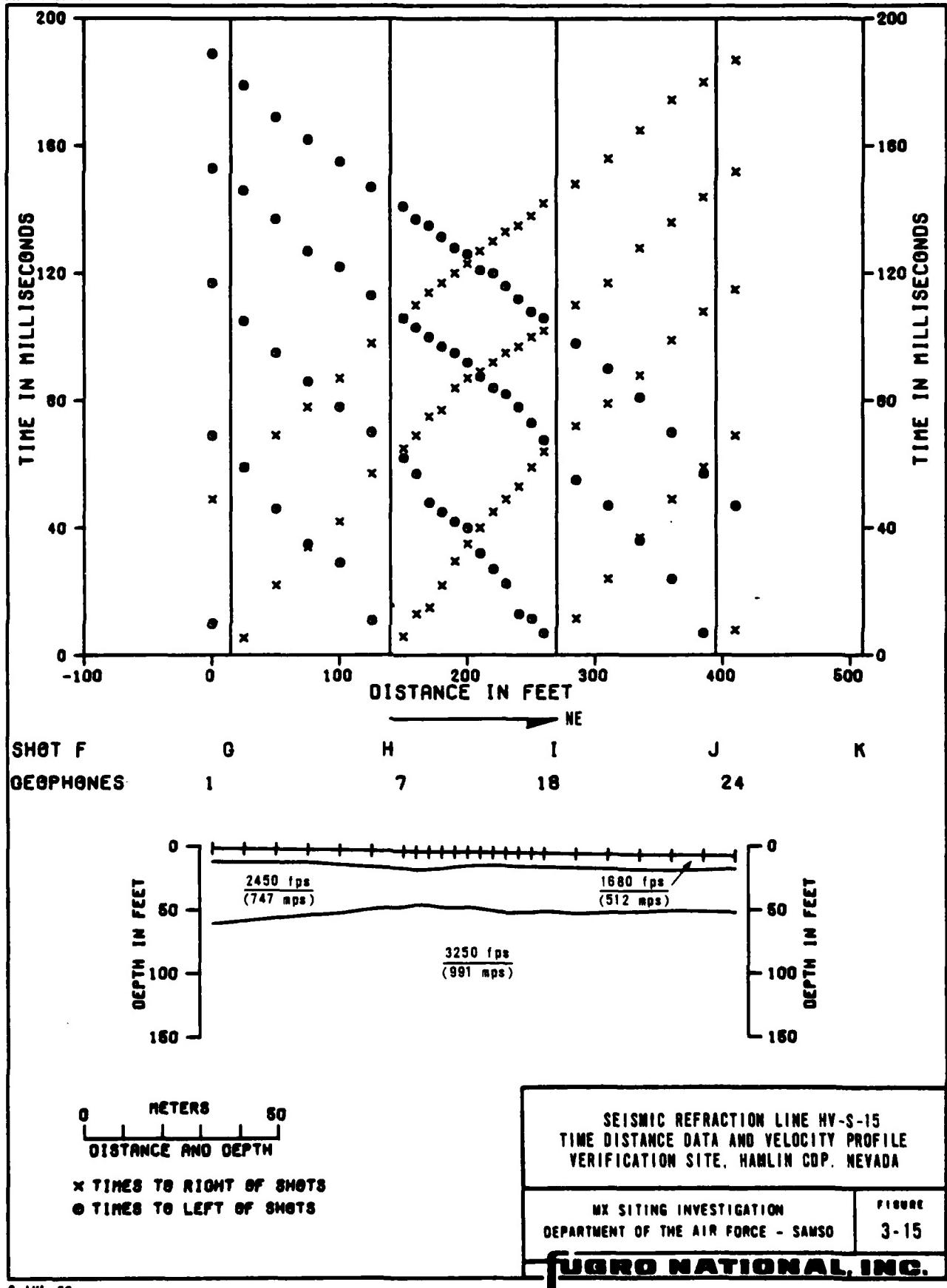
2 JUL 78

SEISMIC REFRACTION LINE HV-S-14  
TIME DISTANCE DATA AND VELOCITY PROFILE  
VERIFICATION SITE, HAMLIN CDP, NEVADA

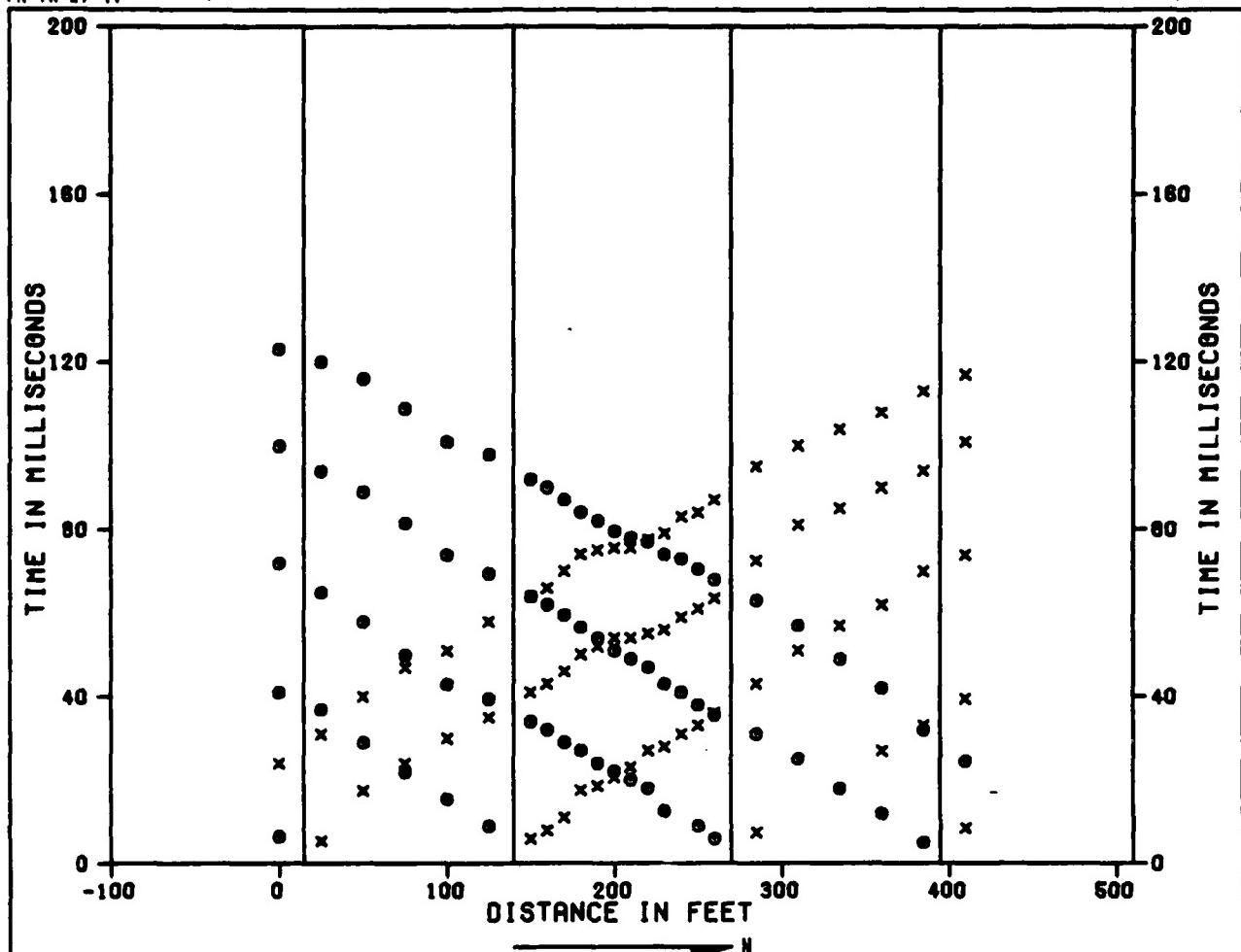
HV SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
3-14

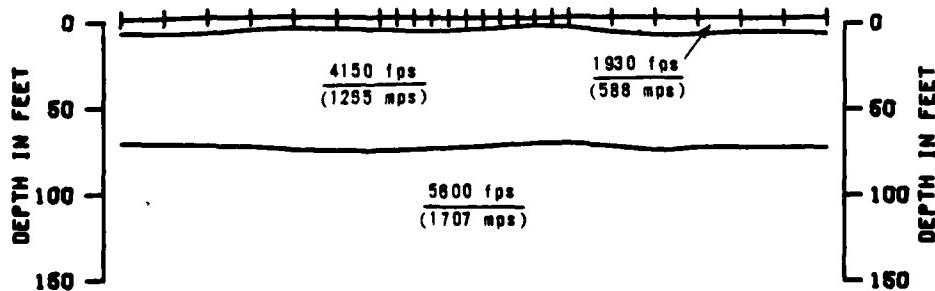
FUGRO NATIONAL, INC.



FN-TR-27-IV



SHOT F	G	H	I	J	K
GEOPHONES	1	7	18	24	



0 METERS  
DISTANCE AND DEPTH

X TIMES TO RIGHT OF SHOTS  
◎ TIMES TO LEFT OF SHOTS

2 JUL 78

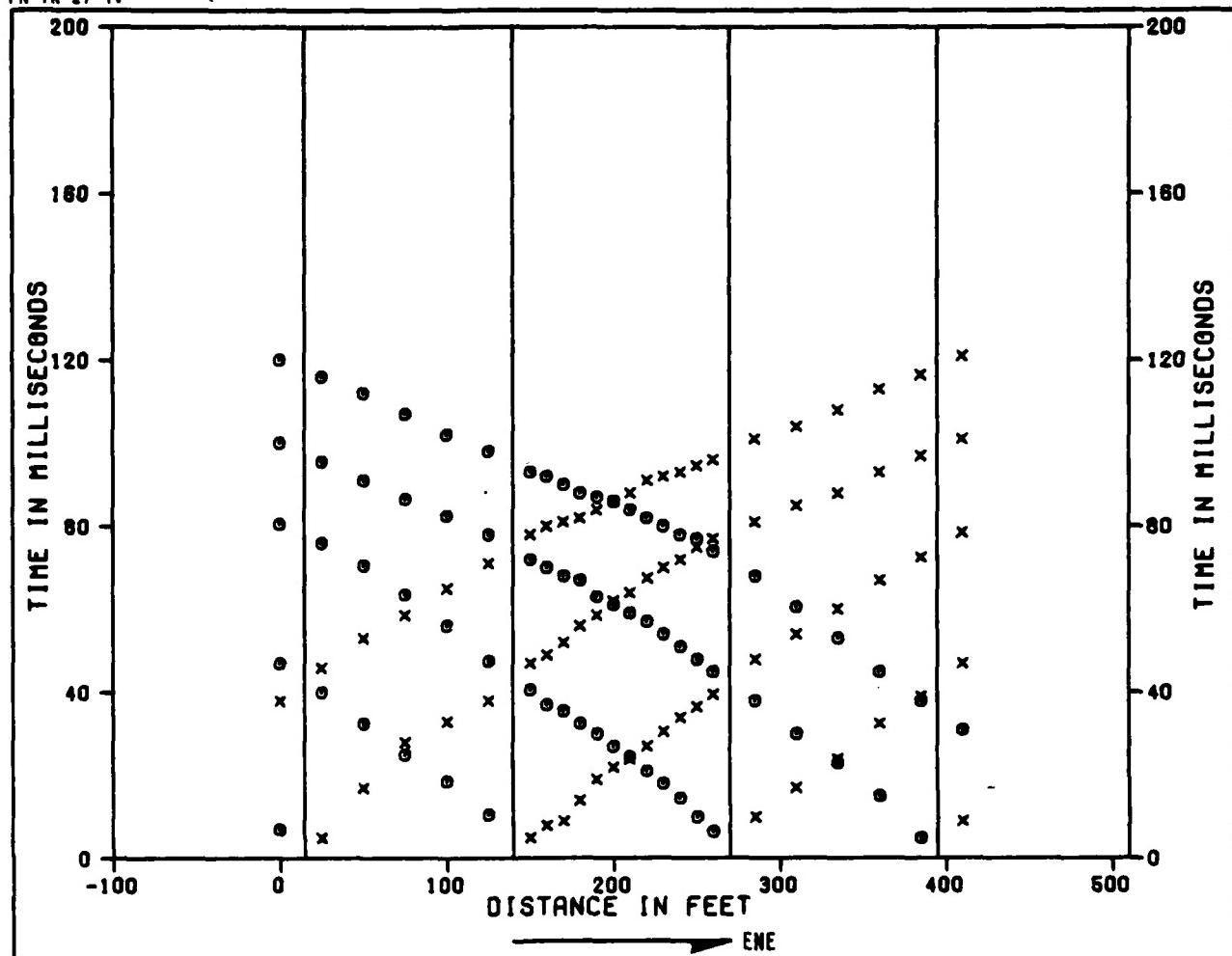
SEISMIC REFRACTION LINE HV-S-16  
TIME DISTANCE DATA AND VELOCITY PROFILE  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

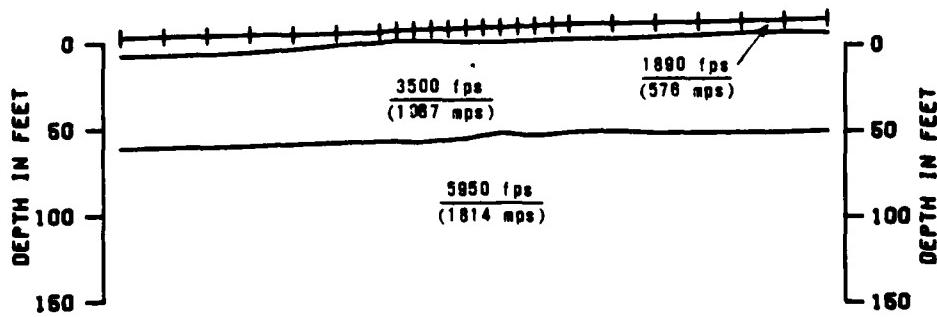
FIGURE  
3-16

**FUGRO NATIONAL, INC.**

FN-TR-27-IV



SHOT F	G	H	I	J	K
GEOFONES	1	7	18	24	



0 METERS  
DISTANCE AND DEPTH

X TIMES TO RIGHT OF SHOTS  
○ TIMES TO LEFT OF SHOTS

2 JUL 78

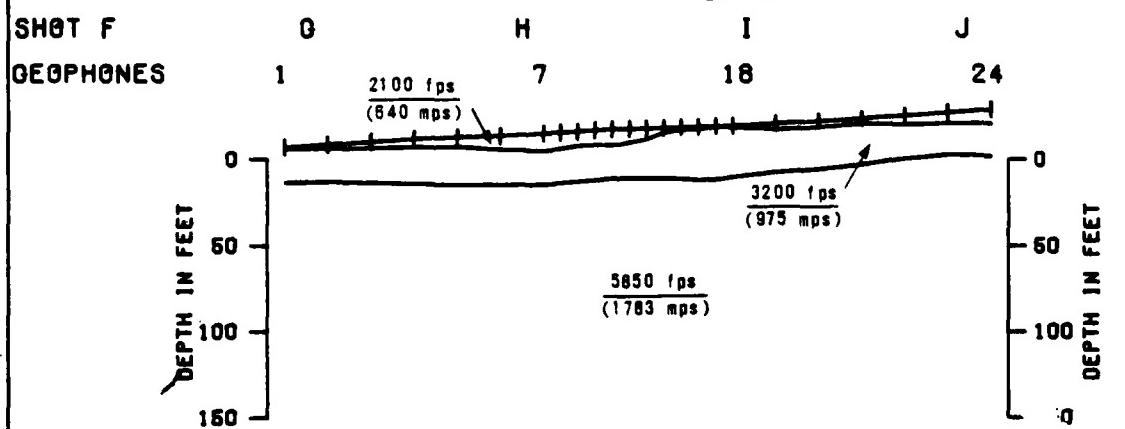
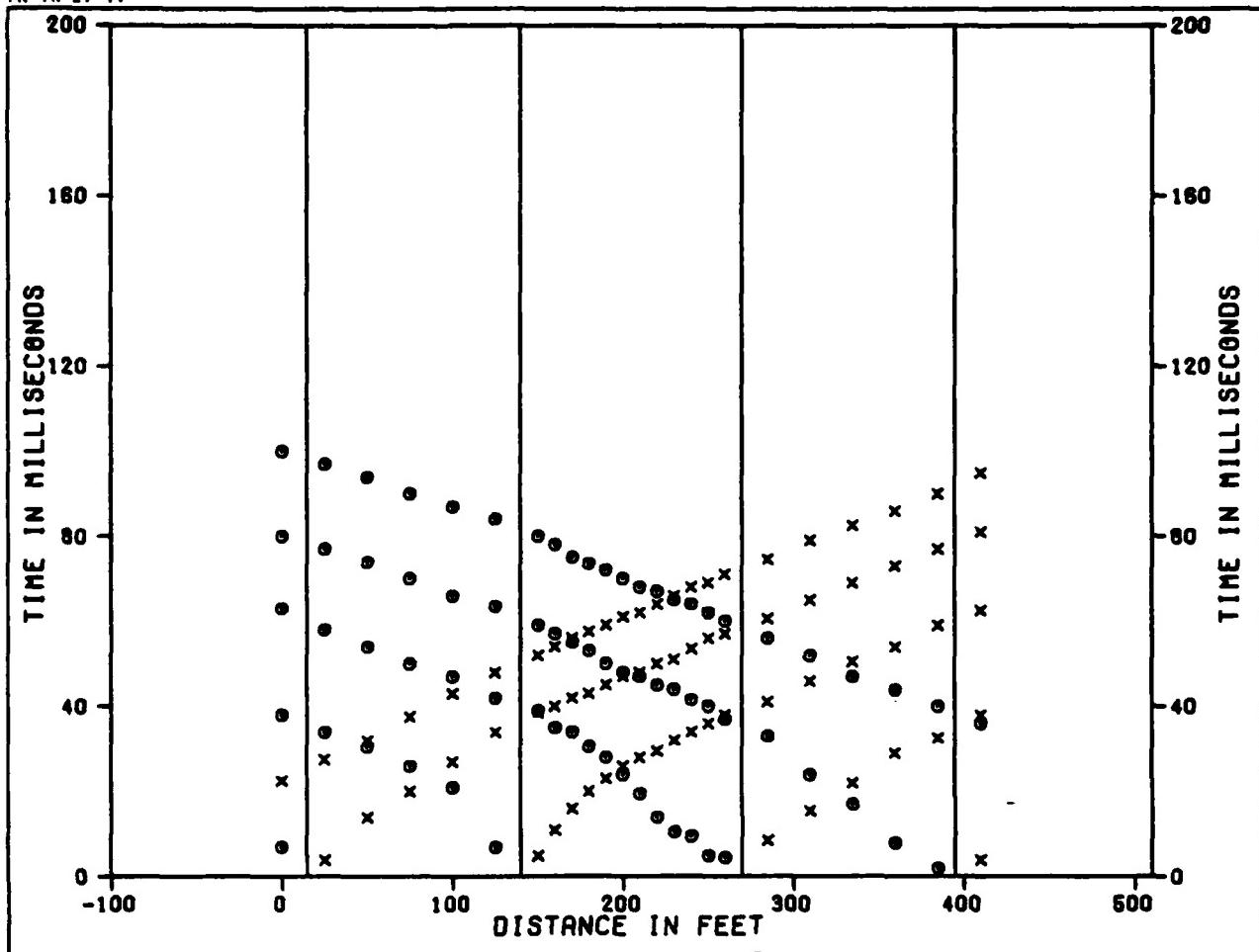
SEISMIC REFRACTION LINE HV-S-17  
TIME DISTANCE DATA AND VELOCITY PROFILE  
VERIFICATION SITE, HAMLIN CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
3-17

**FUGRO NATIONAL, INC.**

FN-TR-27-IV



0      METERS      50

0      DISTANCE AND DEPTH

X TIMES TO RIGHT OF SHOTS  
O TIMES TO LEFT OF SHOTS

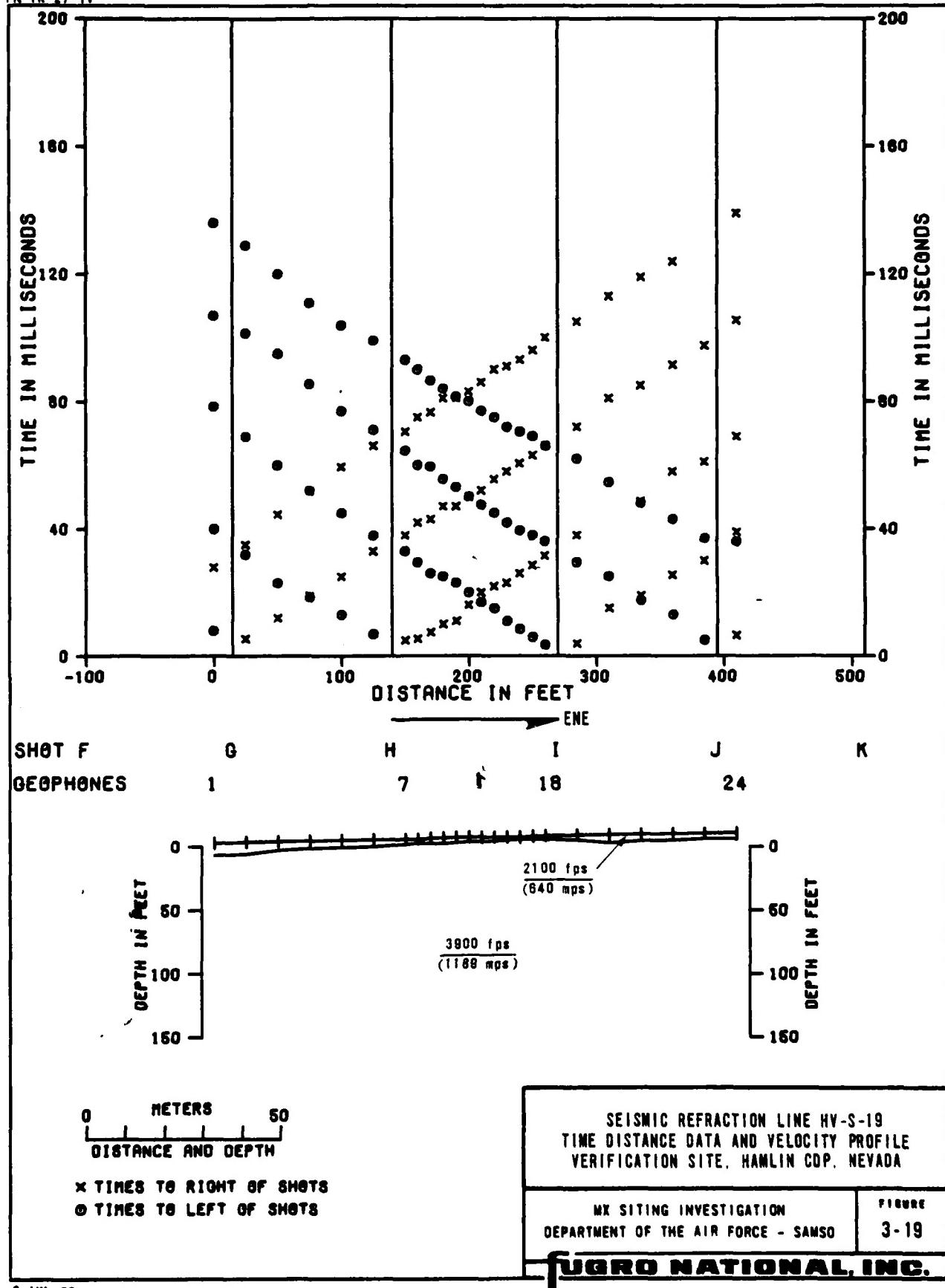
SEISMIC REFRACTION LINE HV-S-18  
TIME DISTANCE DATA AND VELOCITY PROFILE  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
3-18

FUGRO NATIONAL, INC.

FM-TR-27-IV



2 JUL 79

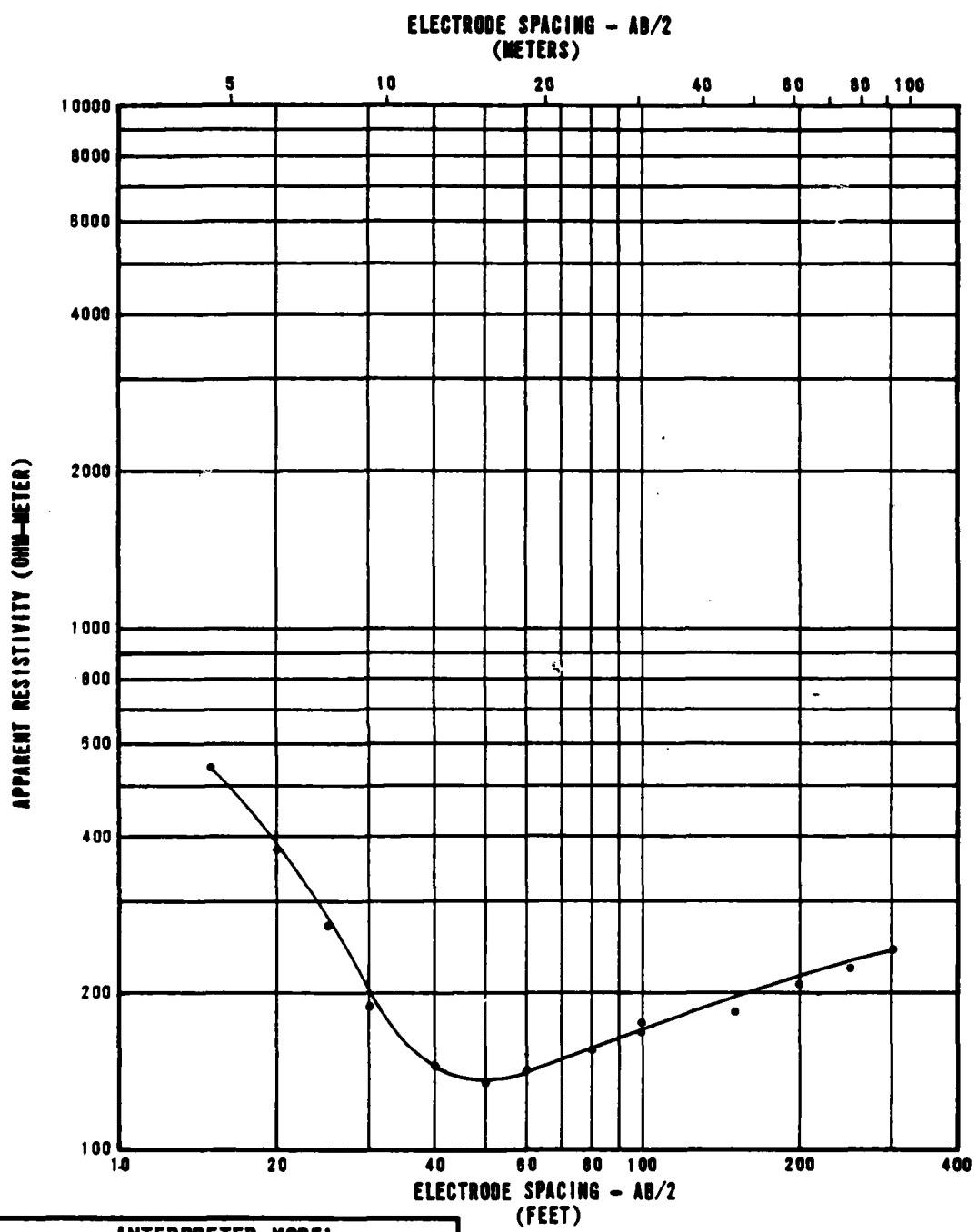
**SECTION 4.0**  
**ELECTRICAL RESISTIVITY DATA**

EXPLANATIONS OF ELECTRICAL RESISTIVITY DATA

Each figure in this section presents the data obtained from a resistivity sounding and a tabulated model of resistivity layers that would produce a curve similar to the observed curve.

The upper portion of the figures is a graph in which measured apparent resistivity values in ohm-meters are plotted versus one-half the distance between the current electrodes.

The interpreted model tabulated at the bottom of the page shows a combination of true resistivity layers and thicknesses obtained by matching theoretical curves to the field curve.



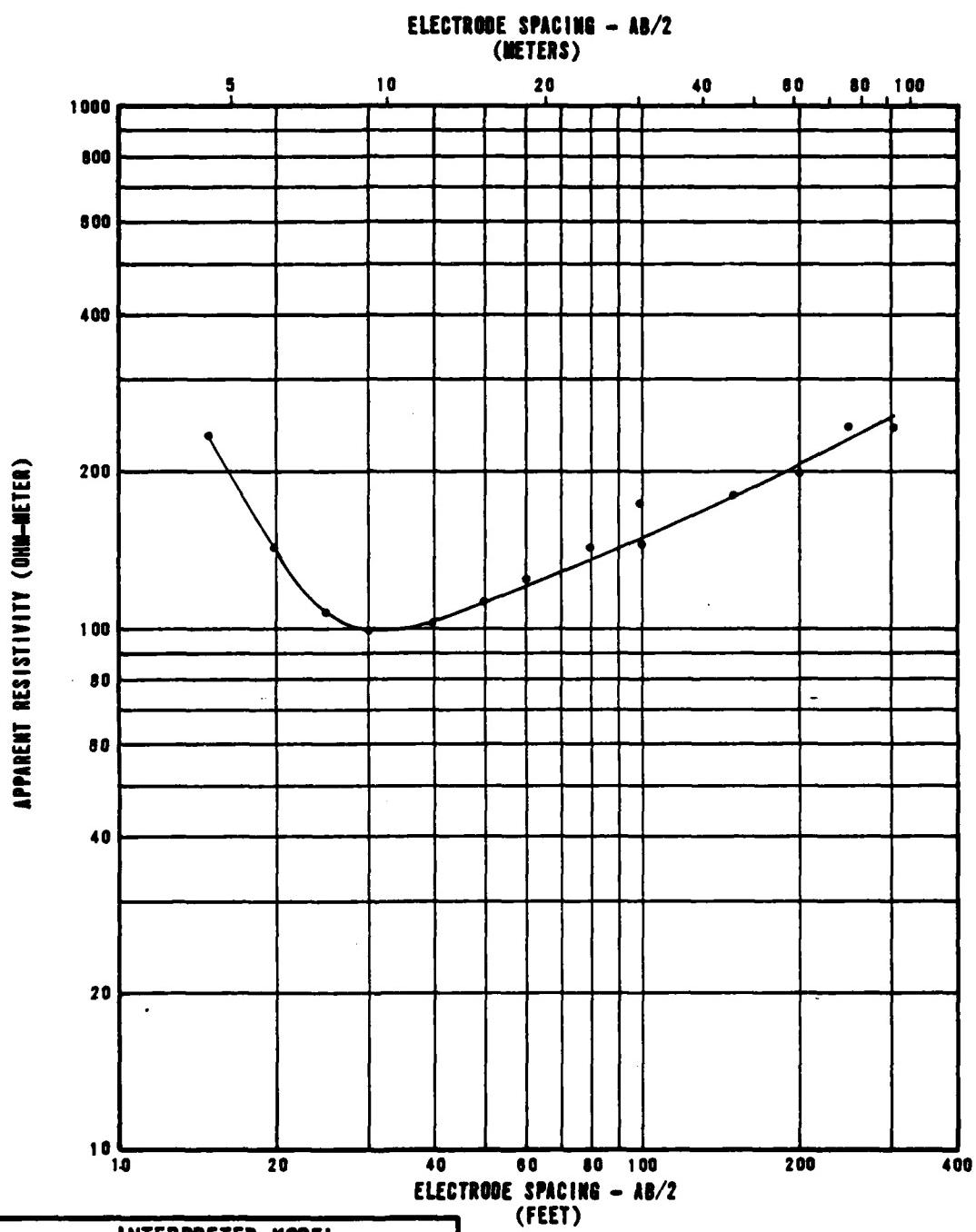
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	840
8	2	230
158	48	380

RESISTIVITY SOUNDING HV-R-1  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-1

FUGRO NATIONAL, INC.



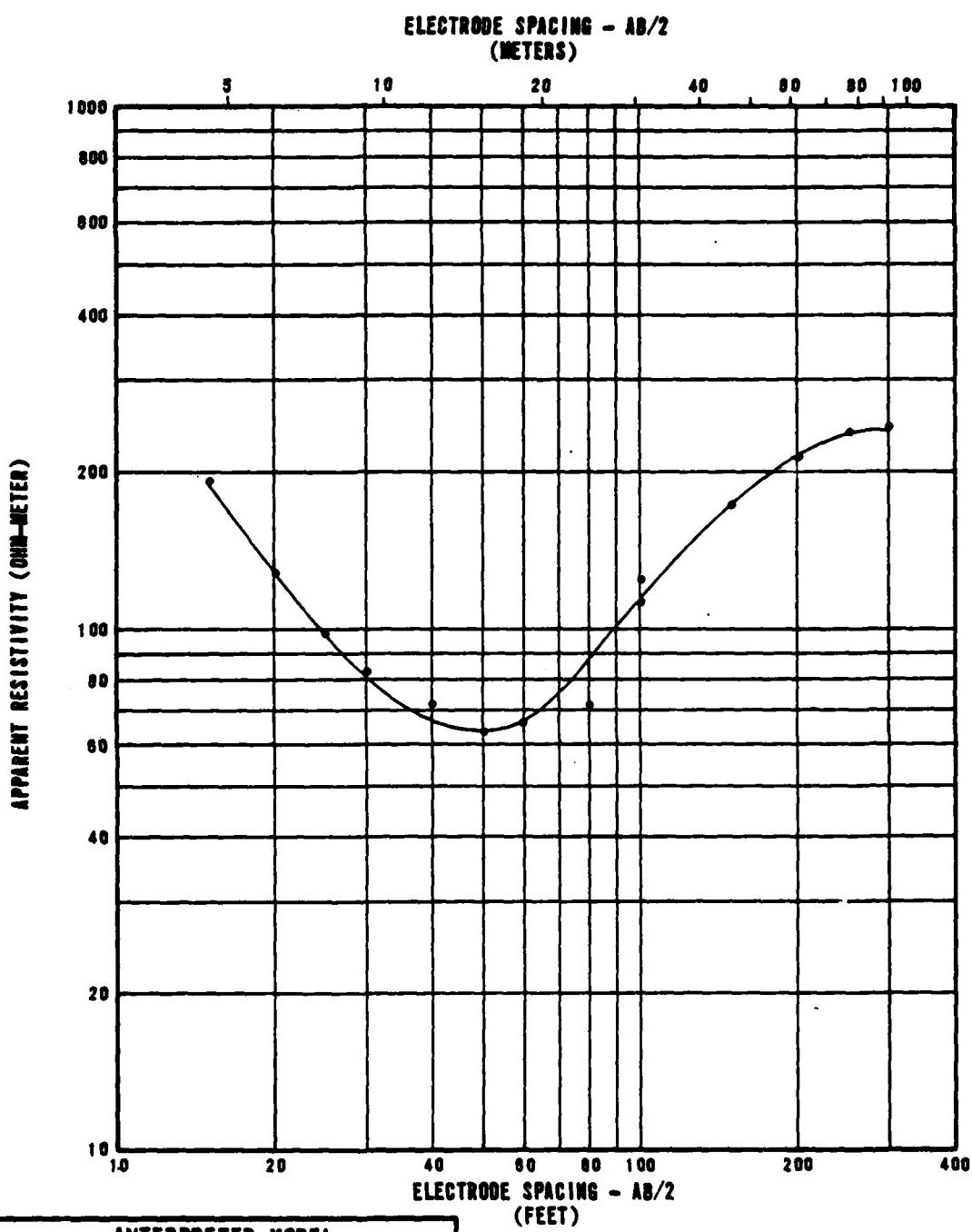
RESISTIVITY SOUNDING HV-R-2  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-2

FUERD NATIONAL, INC.

AFV-13



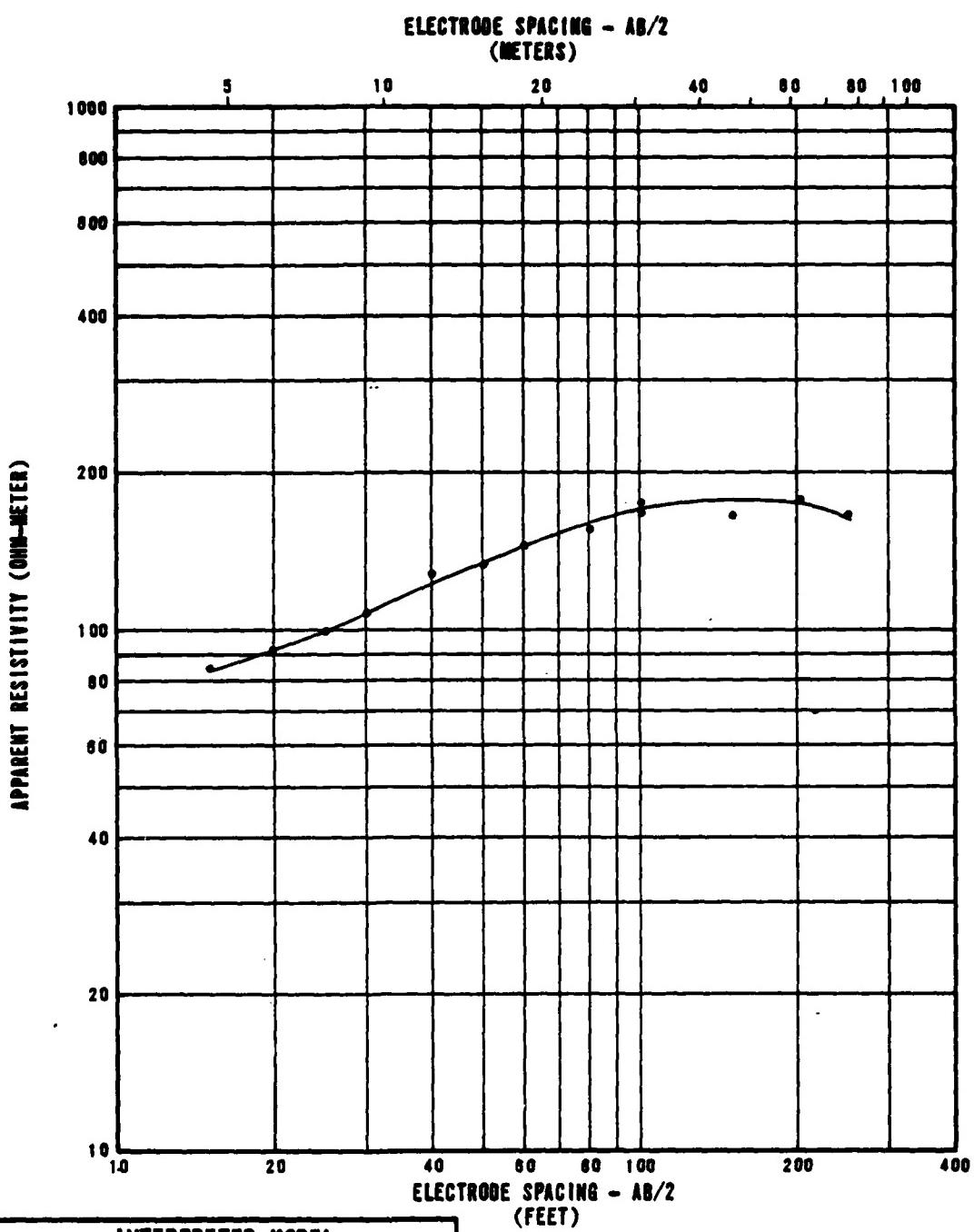
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	190
15	5	30
41	12	420

RESISTIVITY SOUNDING 4V-R-3  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-3

FUJIO NATIONAL INC.

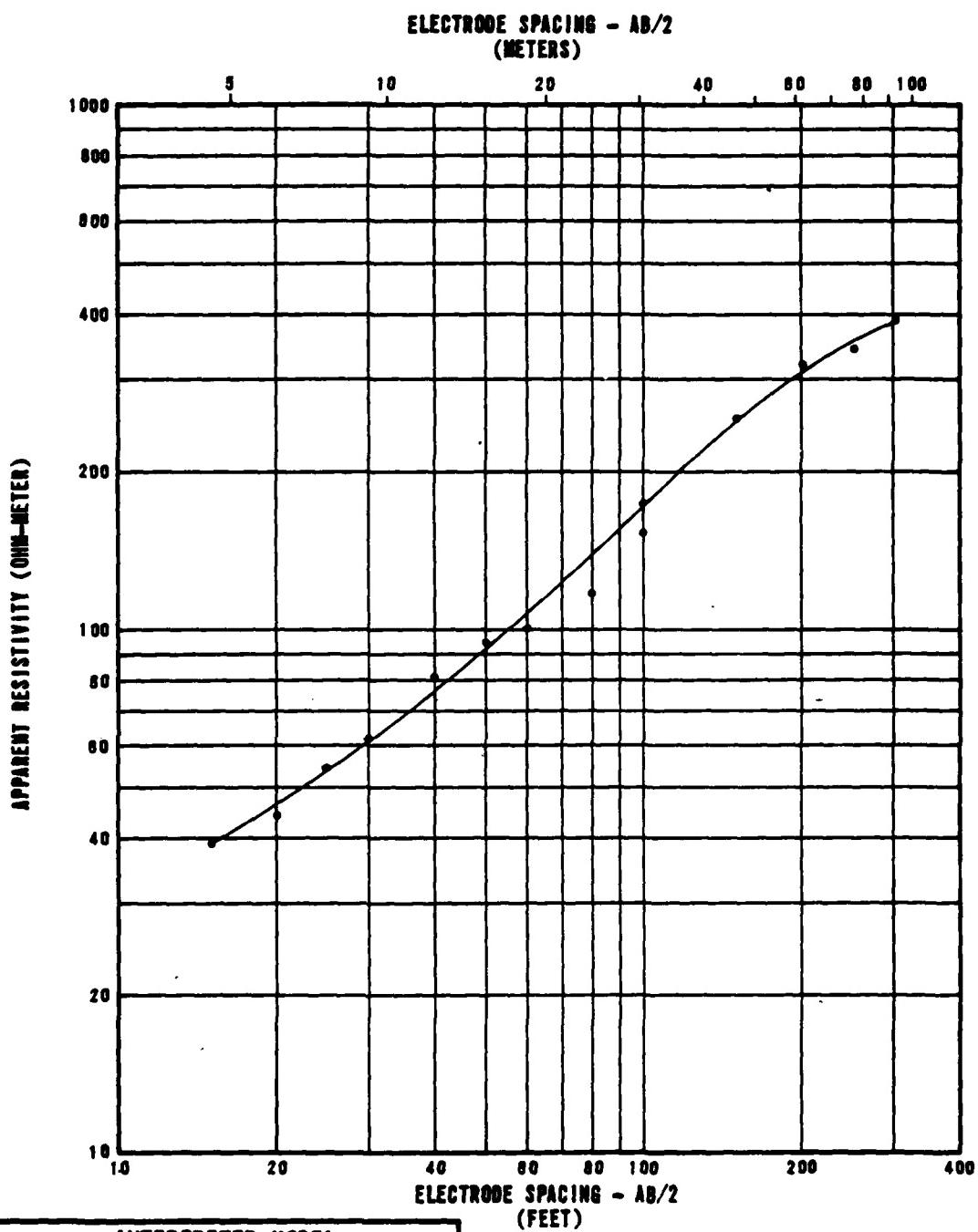


INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	80
18	5	230
122	37	100

RESISTIVITY SOUNDING HV-R-4  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-4



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	35
12	4	140
33	10	850

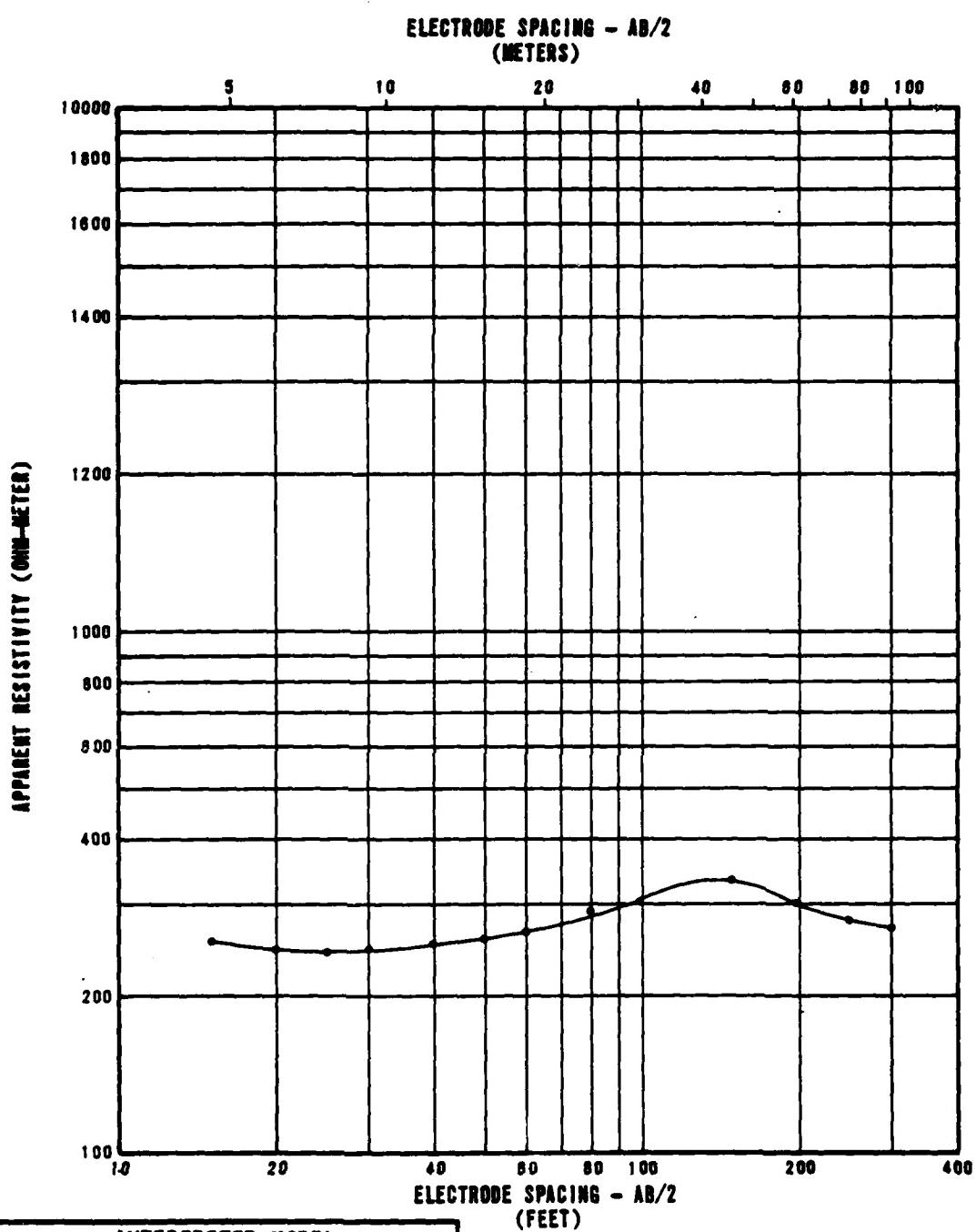
RESISTIVITY SOUNDING HV-R-5  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-5

FUERO NATIONAL, INC.

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	280
7	2	220
27	8	390
118	38	180

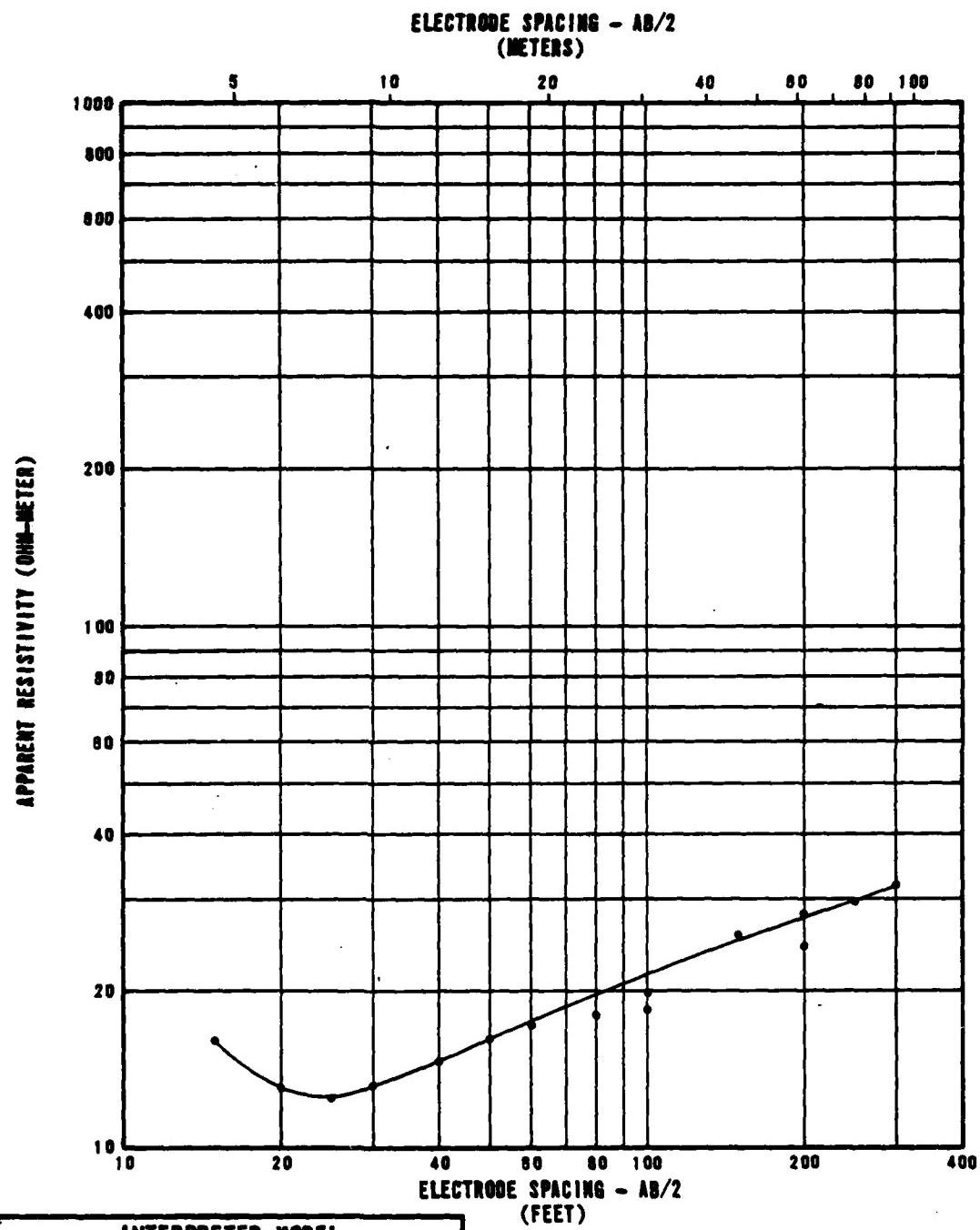
RESISTIVITY SOUNDING HV-R-6  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-6

FUGRO NATIONAL, INC.

AFY-18



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	.25
8	2	.10
24	7	30

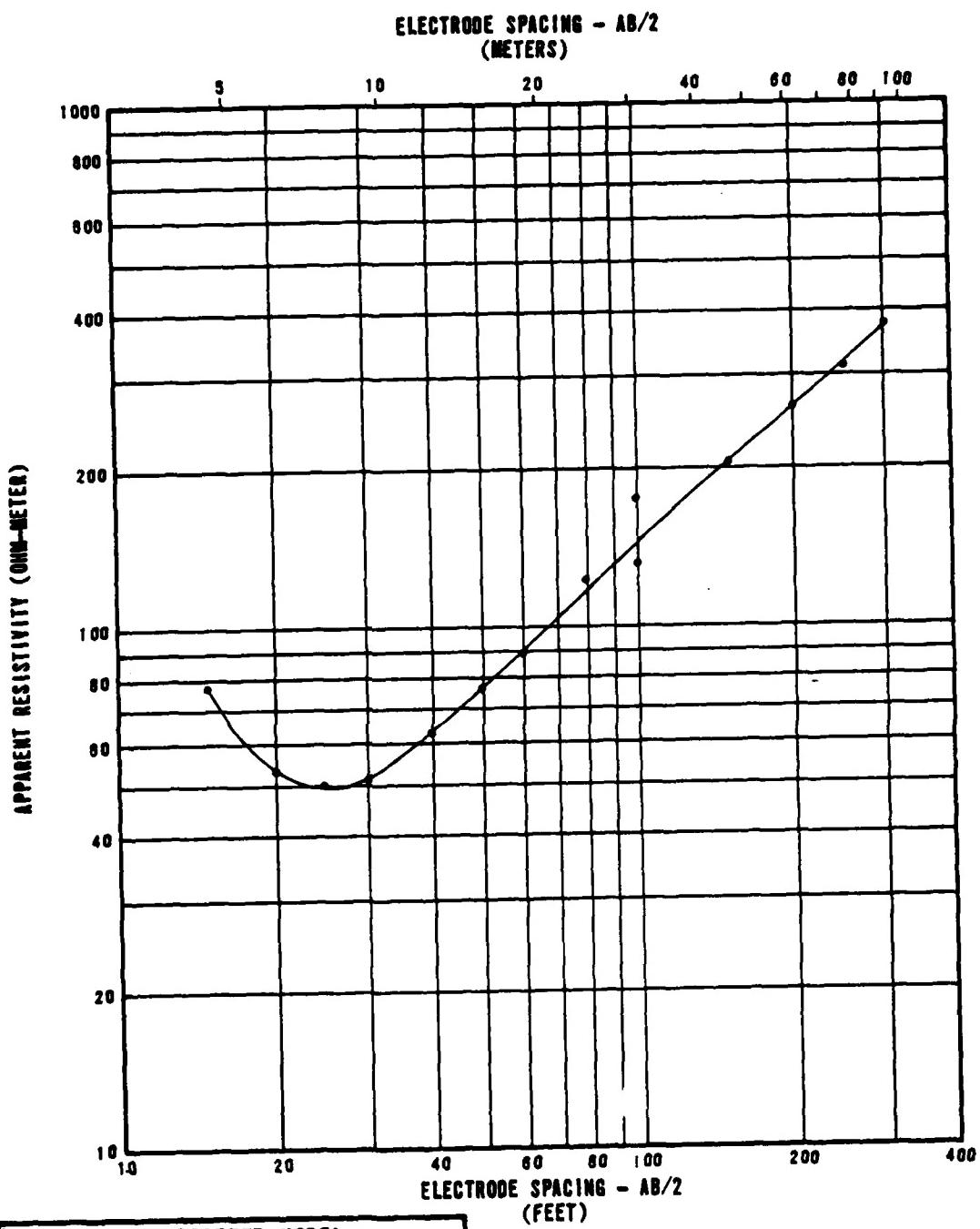
RESISTIVITY SOUNDING HV-R-7  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-7

FUGRO NATIONAL, INC.

AFY-18



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	75
8	2	55
38	11	980

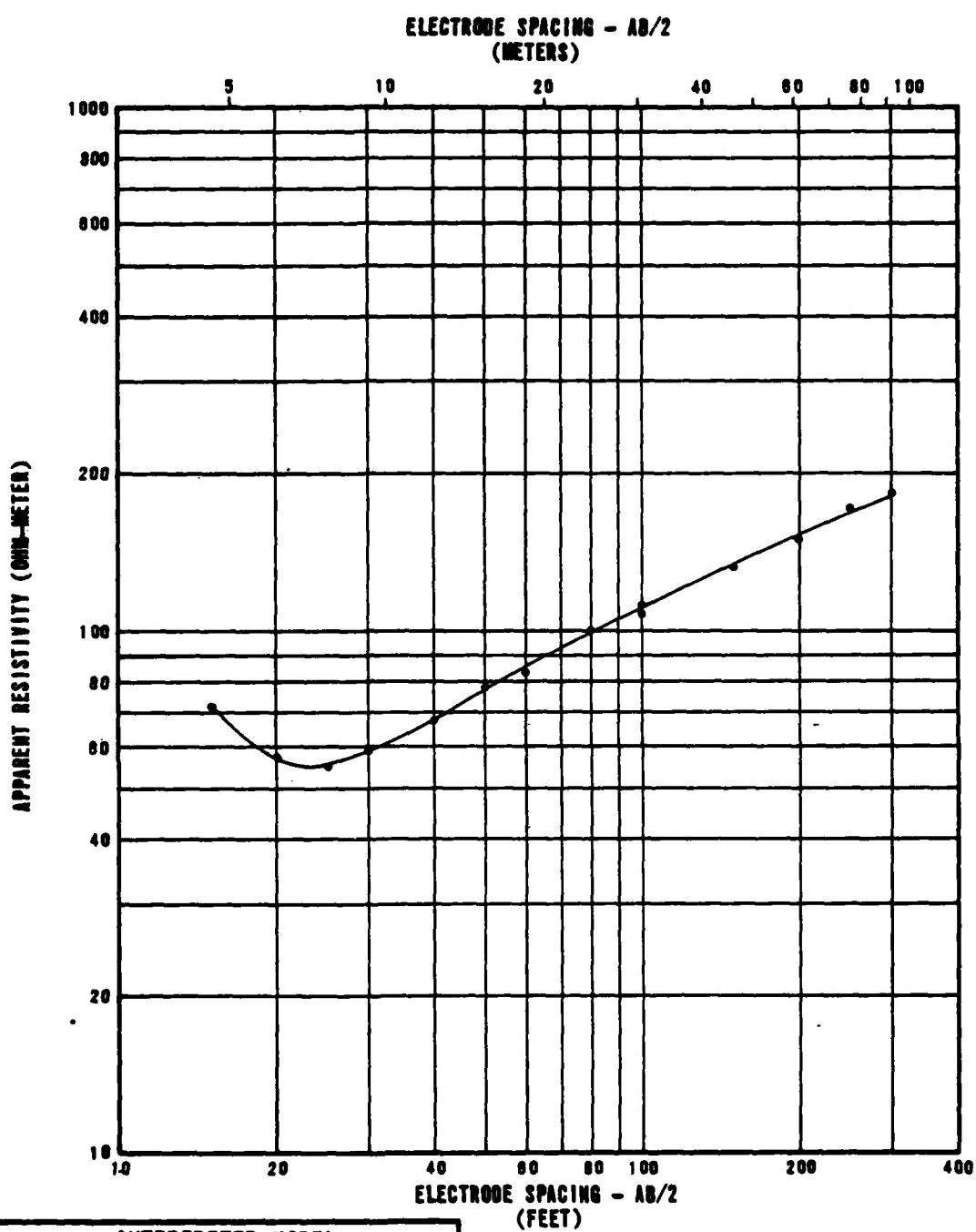
RESISTIVITY SOUNDING HV-R-8  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-8

FUGRO NATIONAL, INC.

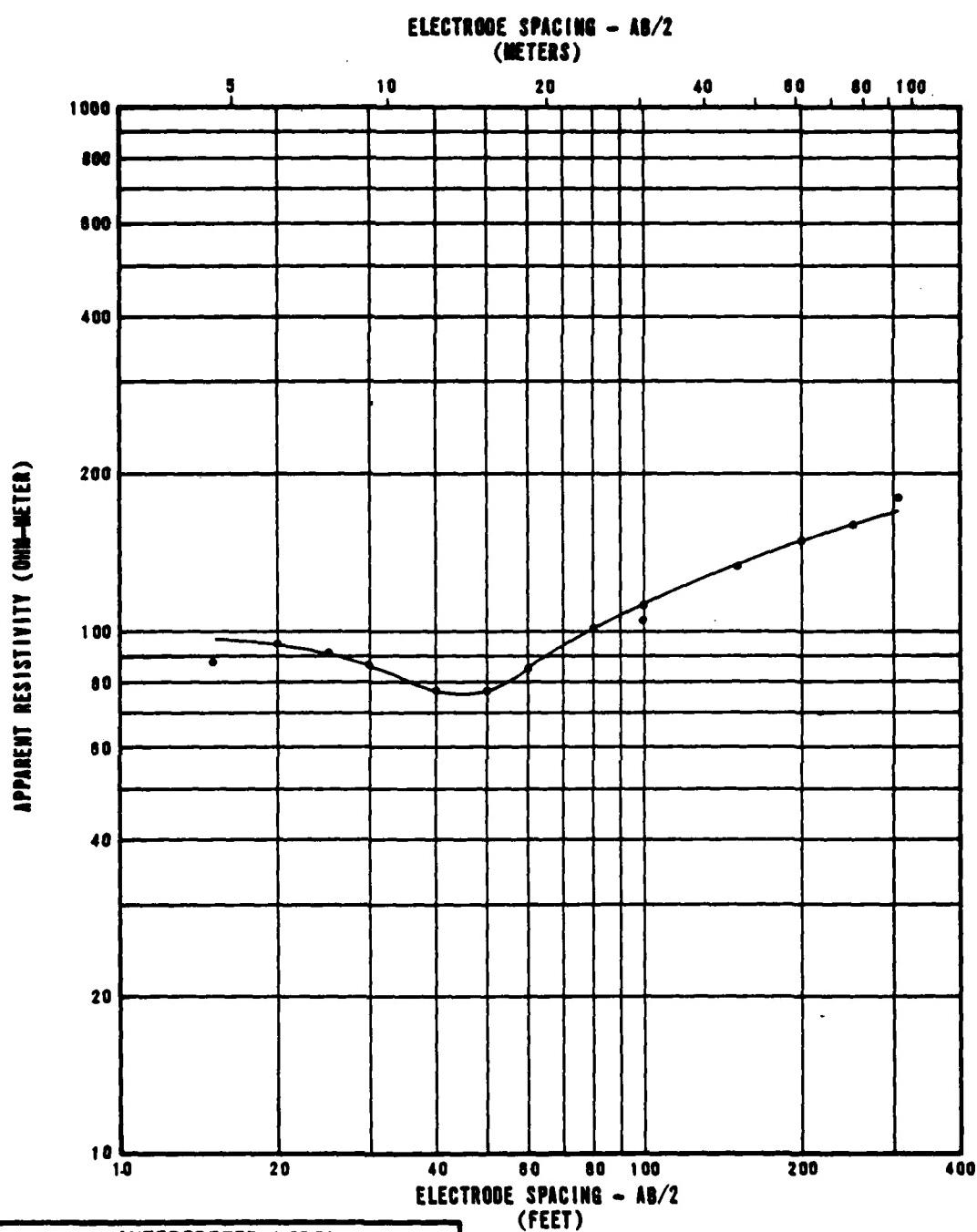
AFV-15



RESISTIVITY SOUNDING HV-R-9  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-9



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	120
10	3	55
39	12	230
70	21	180

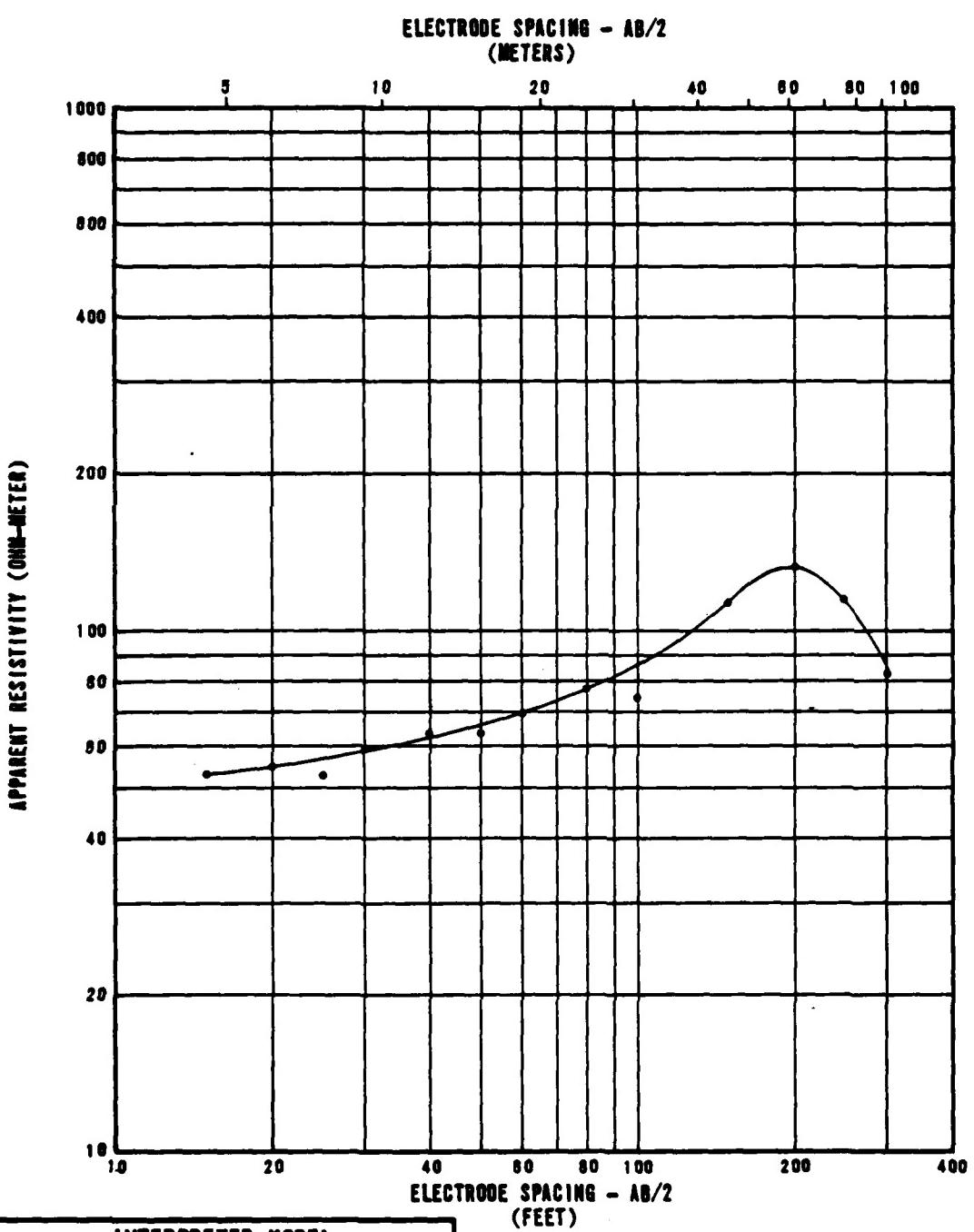
RESISTIVITY SOUNDING HV-R-10  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-10

FUGRO NATIONAL INC.

AFY-18

**INTERPRETED MODEL**

LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	50
28	9	180
182	55	25

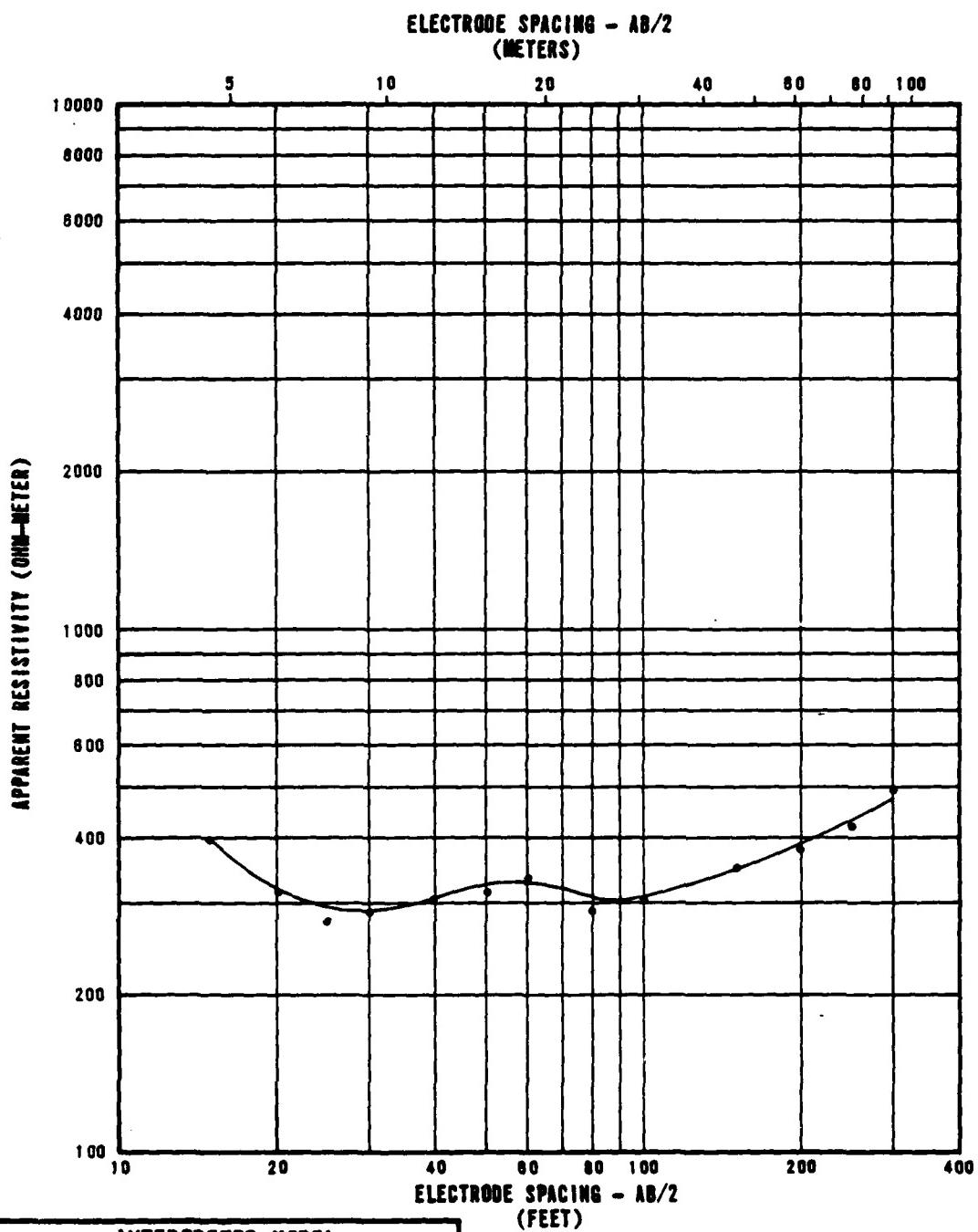
RESISTIVITY SOUNDING HV-R-11  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-11

FUJIO NATIONAL, INC.

AFV-15



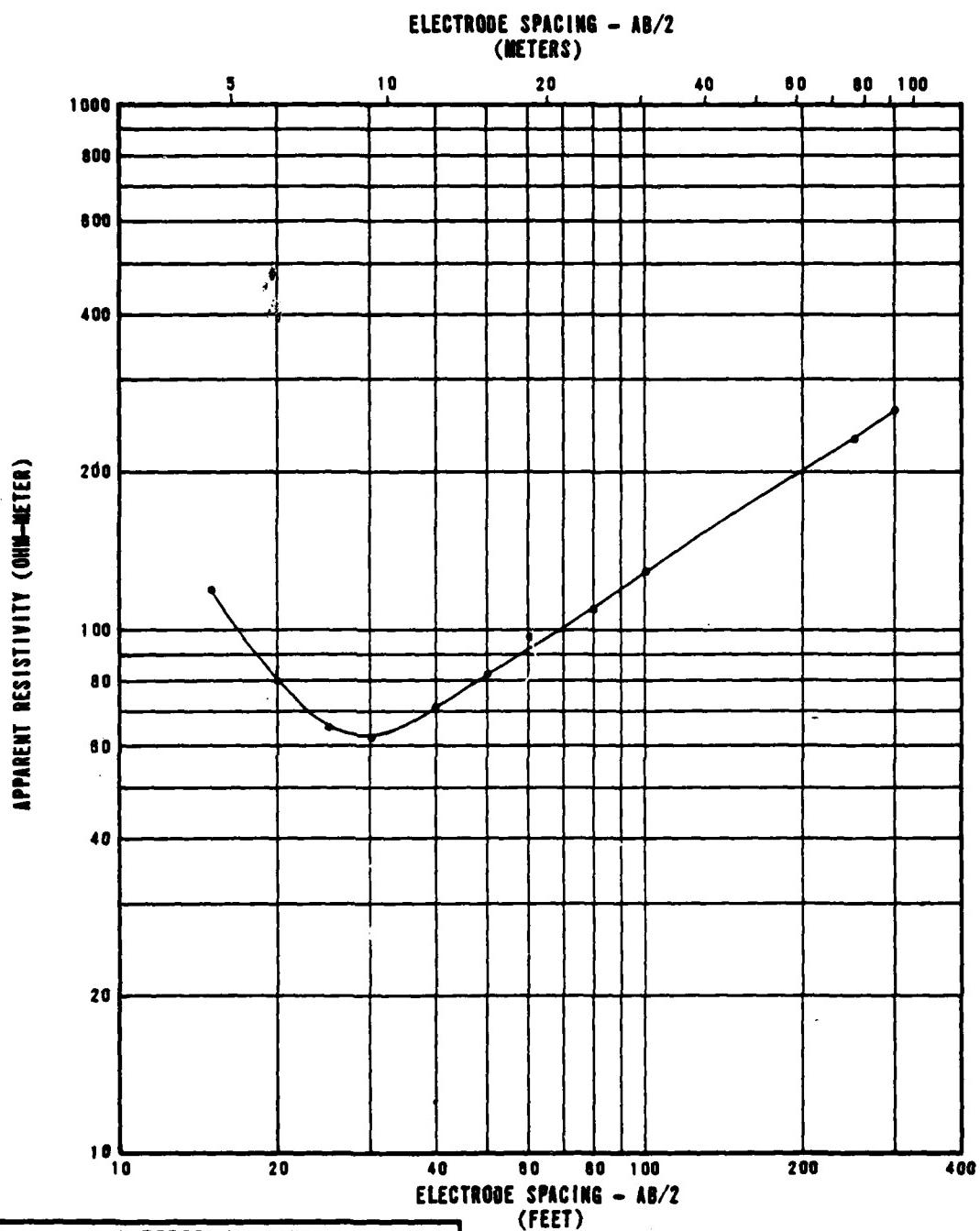
RESISTIVITY SOUNDING HV-R-12  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-12

**FUGRO NATIONAL, INC.**

AFV-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	200
7	2	35
20	6	380
139	42	880

RESISTIVITY SOUNDING HV-R-13  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HANLIN COP, NEVADA

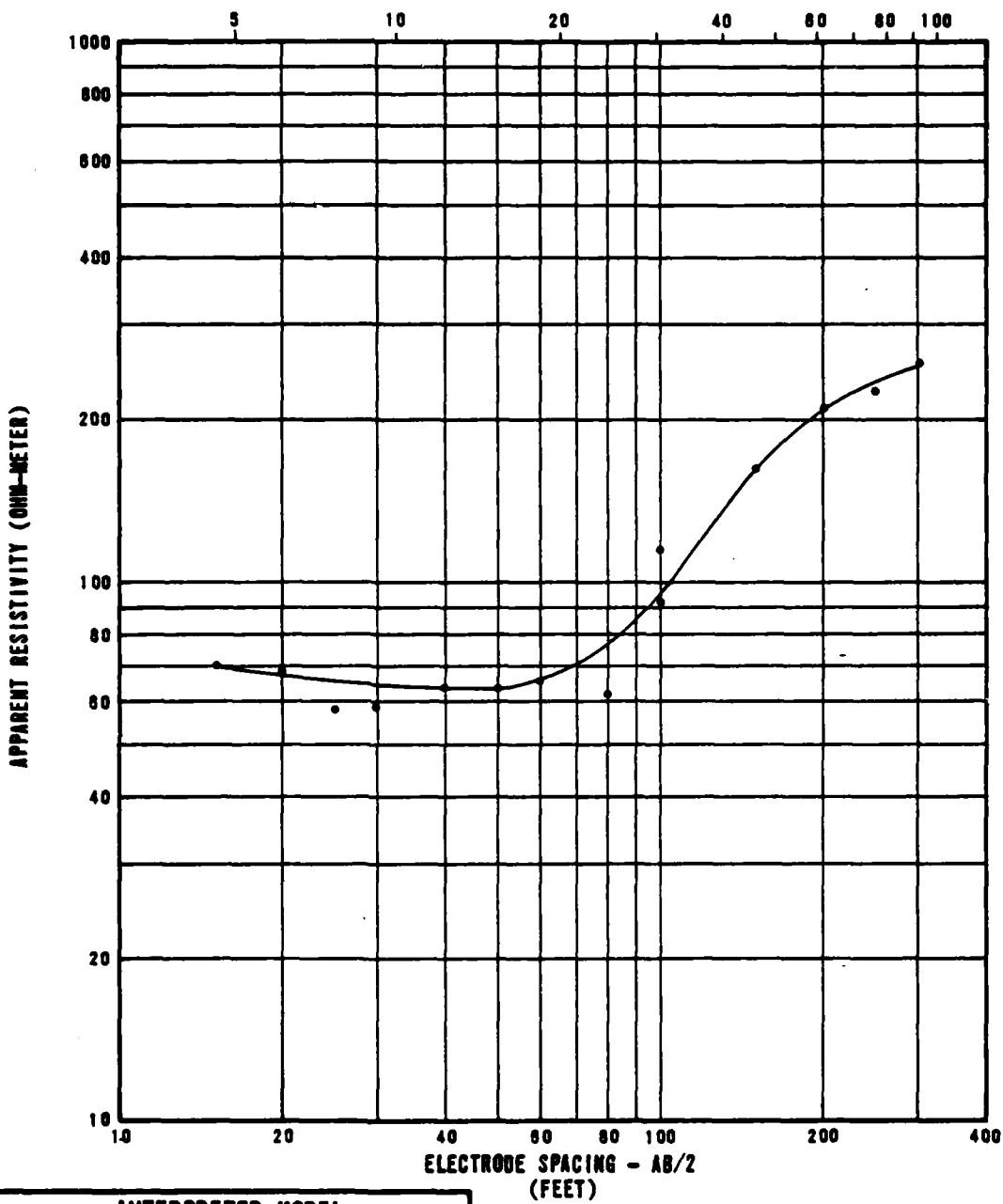
NX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-13

FURD NATIONAL, INC.

AFY-15

ELECTRODE SPACING - AB/2  
(METERS)



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	80
14	4	45
50	15	1170
67	20	840

RESISTIVITY SOUNDING HV-R-14  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

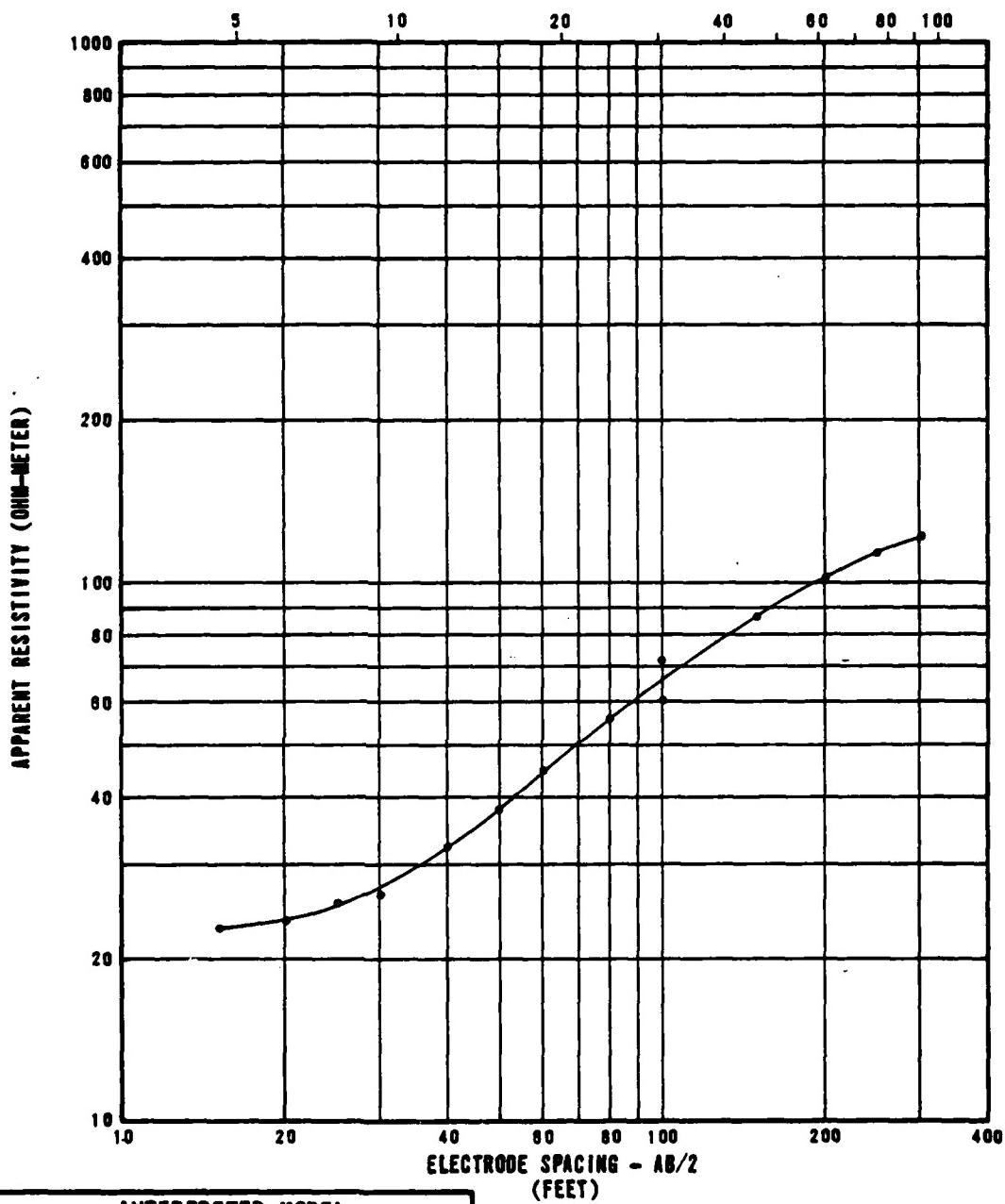
MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-14

FUGRO NATIONAL, INC.

AFY-15

ELECTRODE SPACING - AB/2  
(METERS)



INTERPRETED MODEL

LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	20
25	8	210
157	48	160

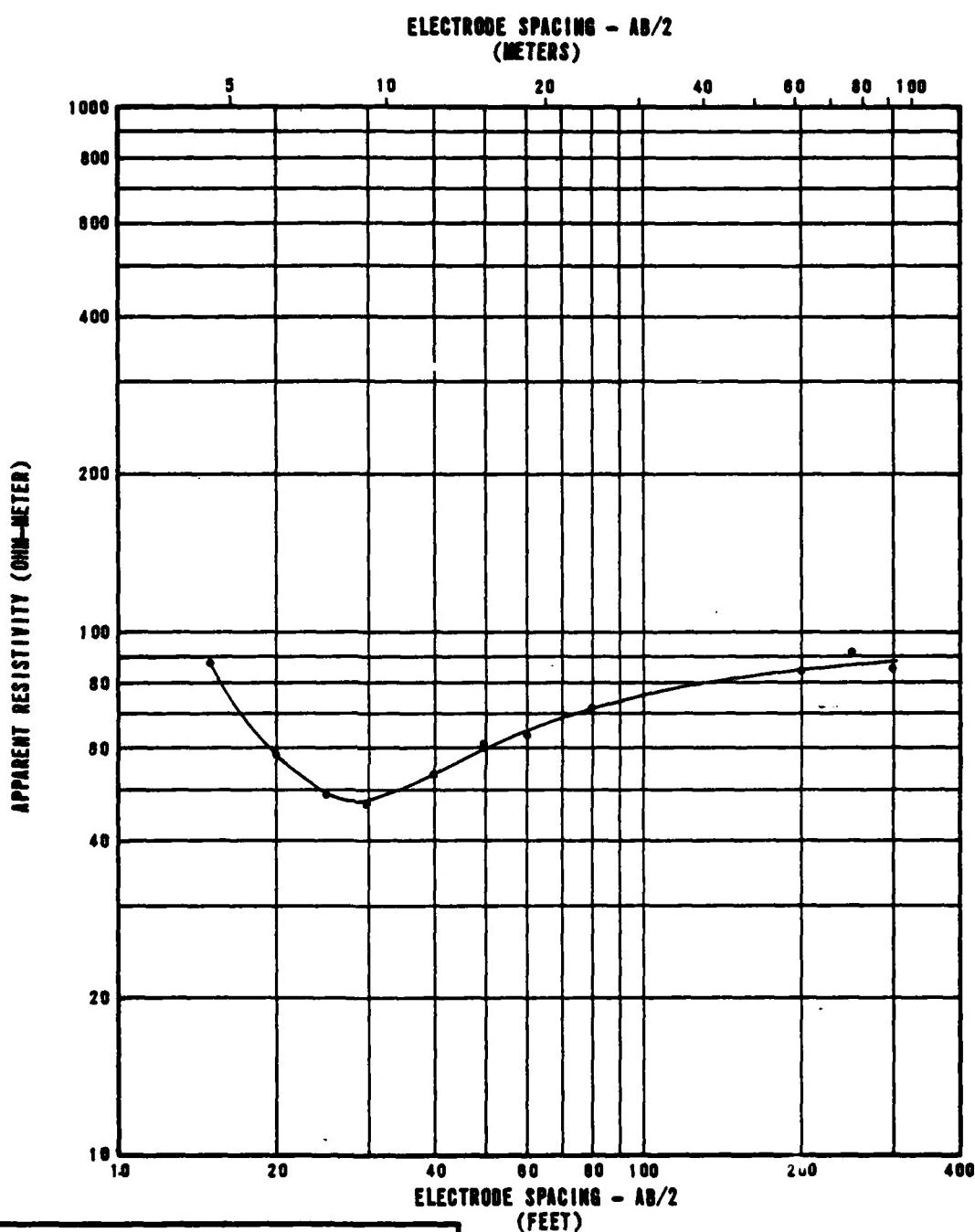
RESISTIVITY SOUNDING HV-R-15  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

NX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-15

FUGRO NATIONAL, INC.

AFY-15



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	85
9	3	40
30	9	160
53	16	90

RESISTIVITY SOUNDING HV-R-18  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

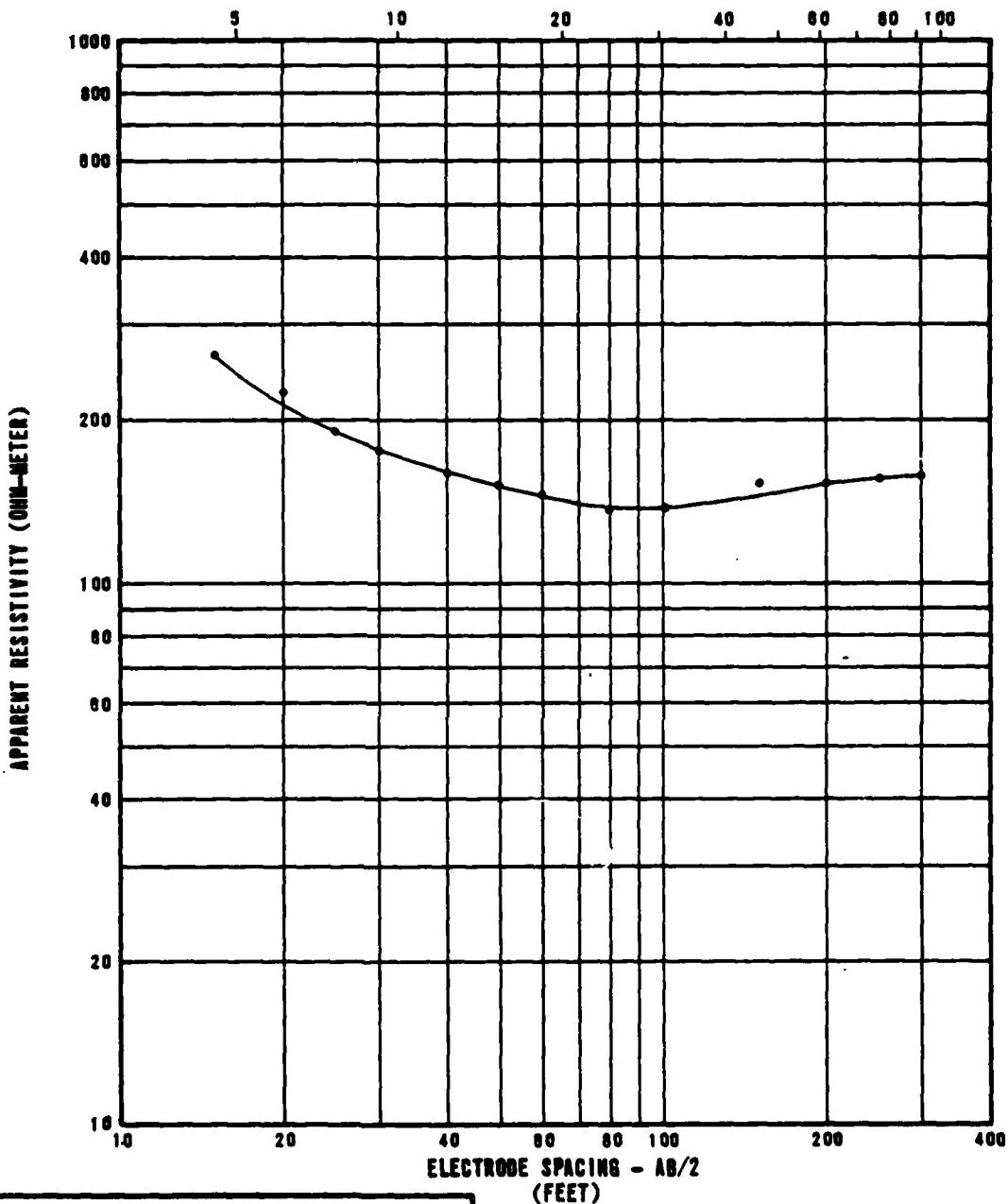
NX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-16

FUGRO NATIONAL, INC.

AFY-15

ELECTRODE SPACING - AB/2  
(METERS)



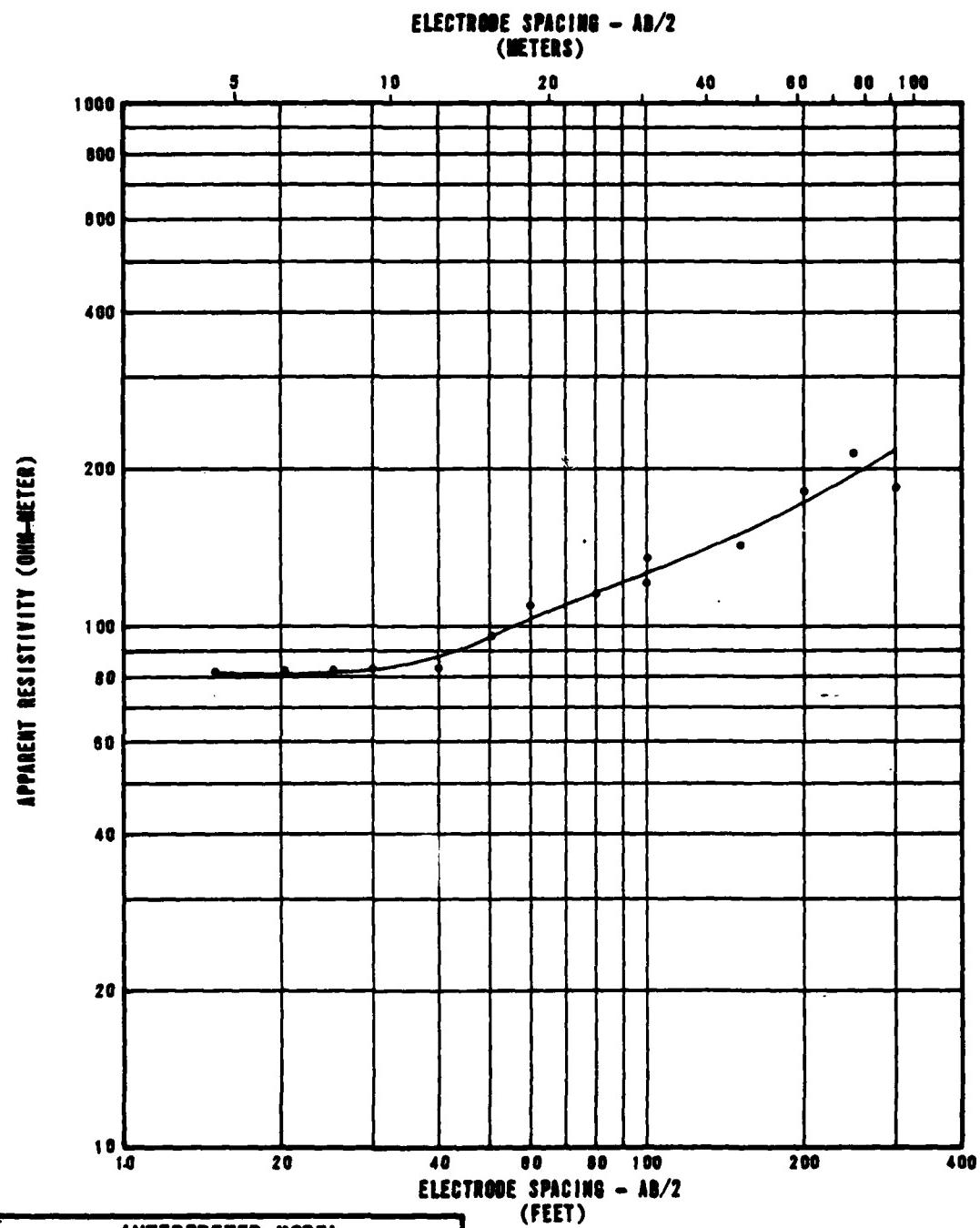
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	400
8	2	120
80	18	180

RESISTIVITY SOUNDING HV-R-17  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-17

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	80
43	13	280
200	61	490

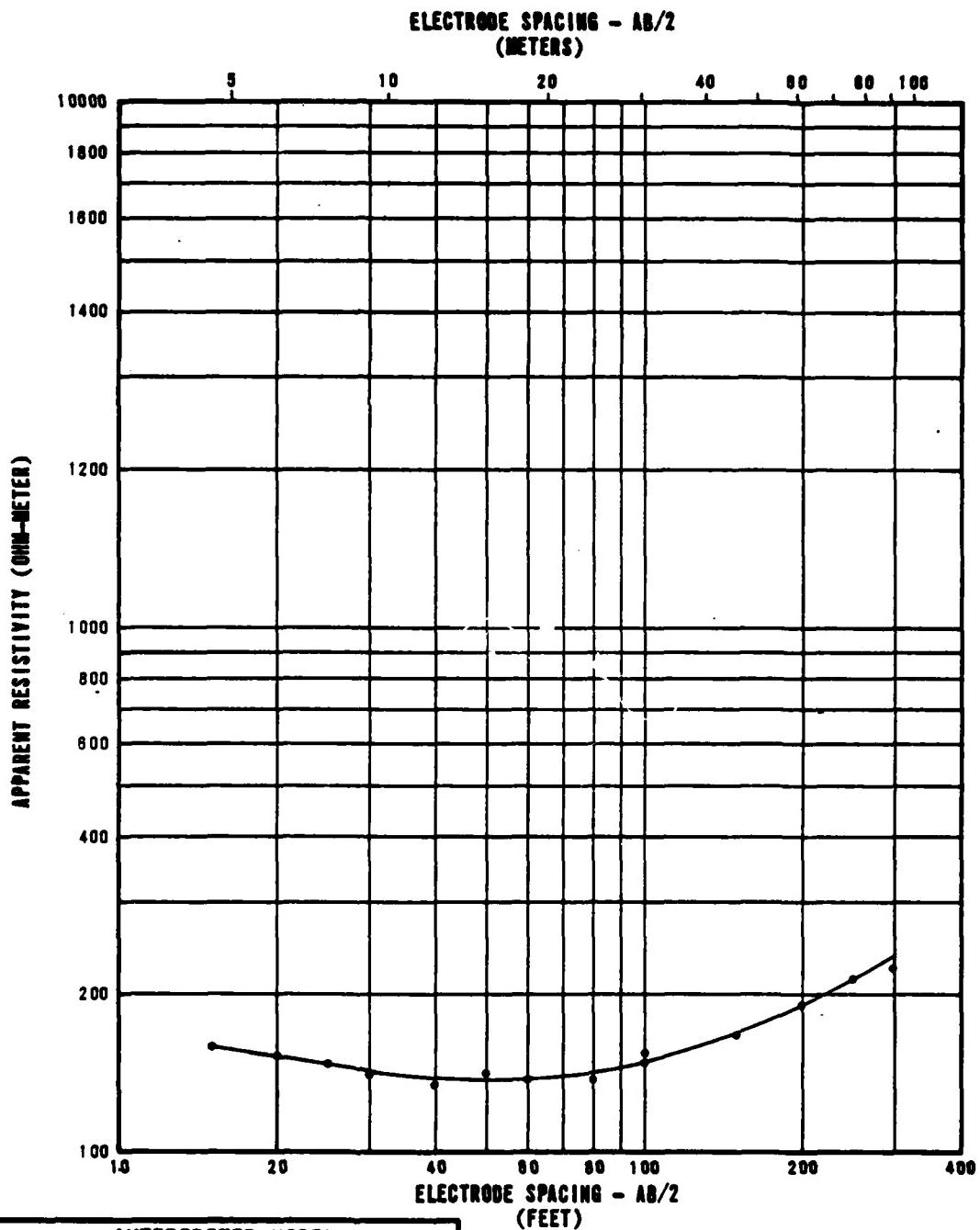
RESISTIVITY SOUNDING HV-R-18  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-18

FUSCO NATIONAL, INC.

AFY-18



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	130
58	18	300

RESISTIVITY SOUNDING HV-R-19  
SOUNDING CURVE AND INTERPRETATION  
VERIFICATION SITE, HAMLIN CDP, NEVADA

NX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
4-19

FUGRO NATIONAL, INC.

AFY-19

**SECTION 5.0**  
**GRAVITY DATA**

EXPLANATIONS OF GRAVITY DATA

Gravity data were not available in time (prior to June 1979) for incorporation into this report. A supplemental report containing gravity data and results will be issued at a later date.

**SECTION 6.0**  
**BORING LOGS**

EXPLANATIONS OF BORING, TRENCH, AND TEST PIT LOGS

All data from borings, trenches, and test pits are presented on standard Fugro National logs in Sections 6.0 and 7.0. The following explanations are provided as a key to the logs.

A. Designations - Borings, trenches, and test pits are identified as follows:

WW-B-1

WW - abbreviation for the site (e.g., WW-Whirlwind)

B - abbreviation for activity (e.g., B-boring, T-trench, P-test pit)

1 - number of activity

B. Sample Type - Different sampling techniques were used and the symbols are explained at the bottom of the boring logs. For details of sampling techniques, see Section A5.0 of Appendix in Volume I. Horizontal lines, to scale, indicate the depth where sampling was attempted.

C. Percent Recovery - The numbers shown represent the ratio (in percent) of the soil sample recovered in the sampler to the full penetration of the sampler.

D. N Value - Corresponds to standard penetration resistance, which is number of blows required to drive a standard split-spoon sampler for the second and third of three 6-inch (15 cm) increments with a 140-pound (63.5 kg) hammer falling 30 inches (76 cm) (ASTM D 1586-67).

E. Depth - Corresponds to depth below ground surface in meters and feet.

F. Lithology - Graphic representation of the soil and rock types.

G. USCS - Unified Soil Classification System (see Table 6-1 for complete details) symbols.

H. Soil Description - Except in cases where samples were classified based on laboratory test data, the descriptions are based on visual classification. The procedures outlined in ASTM D 2487-69, Classification of Soils for Engineering Purposes, and D 2488-69, Description of Soils (Visual-Manual Procedure) were followed. Solid lines across the column indicate known change in strata at the depth shown.

Definitions of some of the terms and criteria to describe soils and conditions encountered during the exploration follow.

Gradation : A coarse-grained soil is well graded if it has a wide range in grain size and substantial amounts of most intermediate particle sizes.

Poorly graded indicates that the soil consists predominantly of one size (uniformly graded) or has a wide range of sizes with some intermediate sizes obviously missing (gap-graded).

Moisture :	Dry	- no feel of moisture
	Slightly Moist	- much less than normal moisture
	Moist	- normal moisture for soil
	Very Moist	- much greater than normal moisture
	Wet	- for soils below the water table (if known)

Soil classification		Laboratory Classification	
		Cone	
Wet sieving particle size smaller than 1 mm and grain fractions on estimated weight	GW	$C_u = \frac{D_{10}}{D_{60}}$ Greater than 4	Not meeting soil gradation requirements for GW
Wet range in grain size and substantial amount of all intermediate particle sizes	GP	$C_u = \frac{D_{10}}{D_{60}}$ Between 1 and 3	Asterisks: Index below "A", fine, with P/B between 3 and 7 are however cases requiring use of dual symbols
Substantially one size or a range of sizes with some intermediate sizes retained	GM	$C_u = \frac{D_{10} \times D_{30}}{D_{60}}$	Asterisks: Index below "A", fine, or P/B less than 3
Plastic limit (or liquid limit) procedures, see CL below	GC	$C_u = \frac{D_{10}}{D_{60}}$ Between 1 and 3	Asterisks: Index above "A", fine, with P/B greater than 7
Wet range in grain sizes and substantial amount of all intermediate particle sizes	SW	$C_u = \frac{D_{10}}{D_{60}}$ Greater than 4	Not meeting soil gradation requirements for SW
Substantially one size or a range of sizes with some intermediate sizes retained	SP	$C_u = \frac{D_{10}}{D_{60}}$ Between 1 and 3	Asterisks: Index below "A", fine, with P/B between 3 and 7 are however cases requiring use of dual symbols
Nonplastic soils (or liquid/plastic procedures, see CL below)	SM	$C_u = \frac{D_{10}}{D_{60}}$ Between 1 and 3	Asterisks: Index below "A", fine, with P/B greater than 7
Plastic limit (or liquid/plastic procedures, see CL below)	SC	$C_u = \frac{D_{10}}{D_{60}}$ Between 1 and 3	Asterisks: Index below "A", fine, with P/B greater than 7
Dry strength (fracturing characteristics)		Plasticity index	
None to slight	None to Name	High	(Give typical name; indicate degree of plasticity, e.g., plastic, plastic clay, plastic silty sand, etc.)
Medium to high	None to Medium	Medium	Medium
Slight to medium	Slight to Slight	Low	Low
Strong to medium	Strong to Strong	Very low	Very low
Sands with sharpness of separation (sharp)		Liquid limit	
Sand and gravel		Plasticity chart	
(For wet sieving, see note 10 in Table 10-1. In dry sieving, the following may be used as a guide to estimate liquid limit)		for laboratory classification of fine grained soils	
Gravels and cobbles		Plasticity chart	
Highly Organic Soils		Plasticity chart	

三

*Scutellaria galericulata* L. (Fig. 1) is a common species throughout the eastern United States.

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THE SILENT SPHERE

卷之三

નાના કાલીન પ્રાચીન વિજયનામાં

Digitized by srujanika@gmail.com

water if necessary to make the soil soft but it

ପ୍ରକାଶକ ମେଳିକା

Comments from the appropriate unit manager on the

changes in a heavy commodity and business

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### APPENDIX OF TABLES OF WAVE CLUSTERING AND OF

successing effort in delineating the characters of

卷之三

Thus, above a moderate stack height

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## UNIFIED SOIL CLASSIFICATION SYSTEM

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSON

TABLE  
6-1

**Consistency:** Consistency descriptions of coarse-grained soils (GW, GP, GM, GC, SW, SP, SM, SC) are as follows.

<u>Consistency</u>	N Value (ASTM D 1586-67)
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

Consistency descriptions of fine-grained soils (ML, CL, MH, CH,) are as follows:

<u>Consistency</u>	Shear Strength (ksf) (kn/m <sup>2</sup> )	Field Guide
Very Soft	0.25      12	Sample with height equal to twice the diameter, sags under own weight
Soft	0.25- 0.50      12 - 24	Can be squeezed between thumb and forefinger
Firm	0.50- 1.00      24- 48	Can be molded easily with fingers
Stiff	1.00- 2.00      48- 96	Can be imprinted with slight pressure from fingers
Very Stiff	2.00- 4.00      96- 192	Can be imprinted with considerable pressure from fingers
Hard	over 4.00      over 192	Cannot be imprinted by fingers

**Grain Shape:** Angular - particles have sharp edges and relatively plane sides with unpolished surfaces.

Subangular - particles are similar to angular but have somewhat rounded edges.

Subrounded - particles exhibit nearly plane sides but have well-rounded corners and edges.

Rounded - particles have smoothly curved sides and no edges.

Calcareous : Containing calcium carbonate; presence of calcium carbonate is commonly identified on the basis of reaction with dilute hydrochloric acid.

Caliche : Soils cemented by porous calcium carbonate and/or other soluble minerals by upward-moving solutions.

Degree of Cementation: (Stages of development of caliche profile)

<u>Stage</u>	<u>Gravelly Soils</u>	<u>Nongravelly Soils</u>
I	Thin, discontinuous pebble coatings	Few filaments or faint coatings
II	Continuous pebble coatings, some interpebble fillings	Few to abundant nodules, flakes, filaments
III	Many interpebble fillings	Many nodules and internodular fillings
IV	Laminar horizon overlying plugged horizon	Increasing carbonate impregnation

Secondary Material : Example - Sand with trace to some silt

Trace - 5-12% (by dry weight)  
 Little - 13-20% (by dry weight)  
 Some - >21% (by dry weight)

Plasticity : Plasticity index is the range of water content, expressed as a percentage of the weight of the oven-dried soil, through which the soil is plastic. It is defined as the liquid limit minus the plastic limit. Descriptive ranges used on the logs include:

Nonplastic (PI, 0 - 4)  
Slightly Plastic (PI, 4 - 15)  
Medium Plastic (PI, 15 - 30)  
Highly Plastic (PI, >31)

Cobbles and Boulders : A cobble is a rock fragment, usually rounded by weathering or abrasion, with an average diameter ranging between 3 and 12 inches (8 and 30 cm).

A boulder is a rock fragment, usually rounded by weathering or abrasion, with an average diameter of 12 inches (30 cm) or more.

- I. Remarks - This column was provided on boring and trench logs for comments regarding drilling difficulty, number and size of cobbles or boulders encountered, trench wall stability, loss of drilling fluid in the boring, and other conditions encountered during drilling and excavations.
- J. Dry Density and Moisture Content - The boring logs include a graphical display of laboratory test results for dry density (ASTM D 2937-71) in pounds per cubic foot and kilograms per cubic meter and moisture content (ASTM D 2216-71) in percent from representative samples taken during drilling. The symbols are explained at the bottom of the boring logs.

K. Sieve Analysis - The numbers represent the percentage by dry weight (ASTM D 422-63) of each of the following soil components:

GR - Gravel, rock particles that will pass a 3-inch (76 mm) sieve and are retained on No. 4 (4.75 mm) sieve.

SA - Sand, soil particles passing No. 4 sieve and retained on No. 200 (0.075 mm) sieve.

FI - Fines, silt or clay, soil particles passing No. 200 sieve.

L. Atterberg Limits (LL and PI) -

LL - Liquid Limit, the water content corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

M. Miscellaneous Information -

Elevations - indicated elevations on the logs are estimated from topographic maps of the study area, within an accuracy of half the contour interval.

Surficial

Geologic Unit - indicates the surficial geologic unit in which the activity is located.

Date Drilled - indicates the period from beginning to completion of the activity.

Drilling

Method - signifies the type of drilling procedure used such as rotary wash.

Hole Diameter - nominal size of boring drilled.

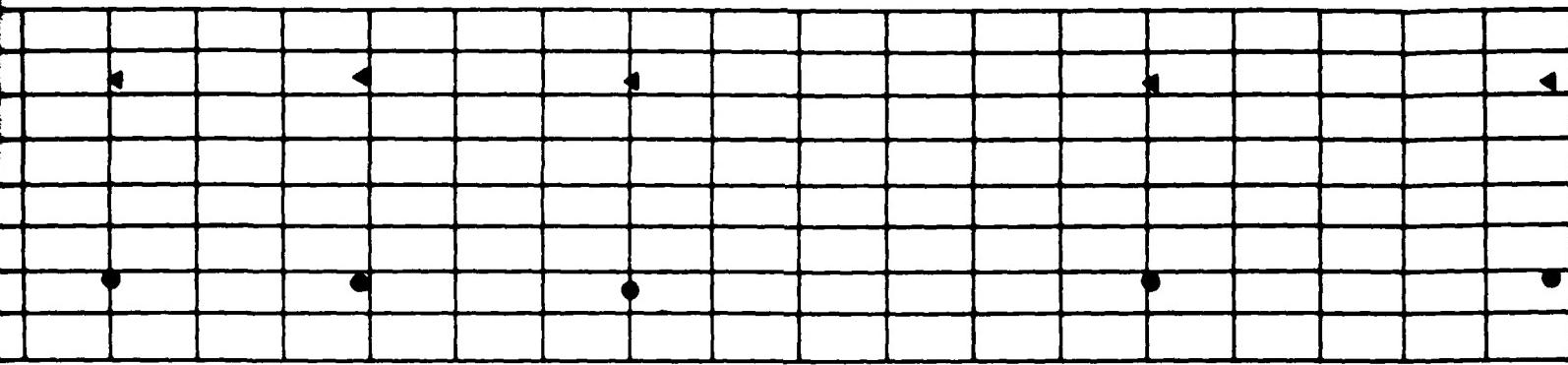
Water Level - indicates depth from ground surface to water table where encountered.

Trench Length - length at ground surface of final trench excavation.

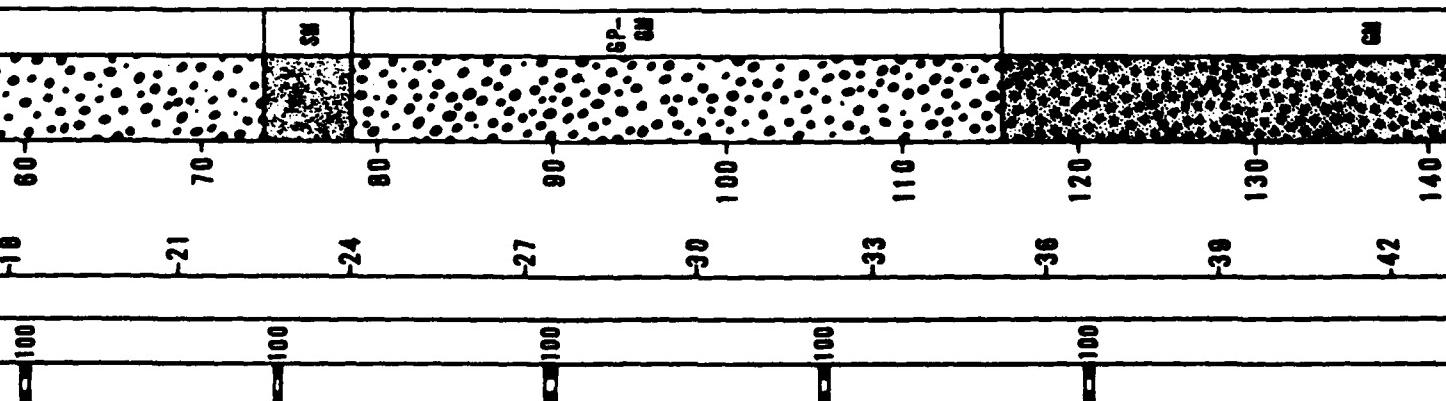
Trench  
Orientation - bearing of longitudinal trench centerline.

CONTENTS

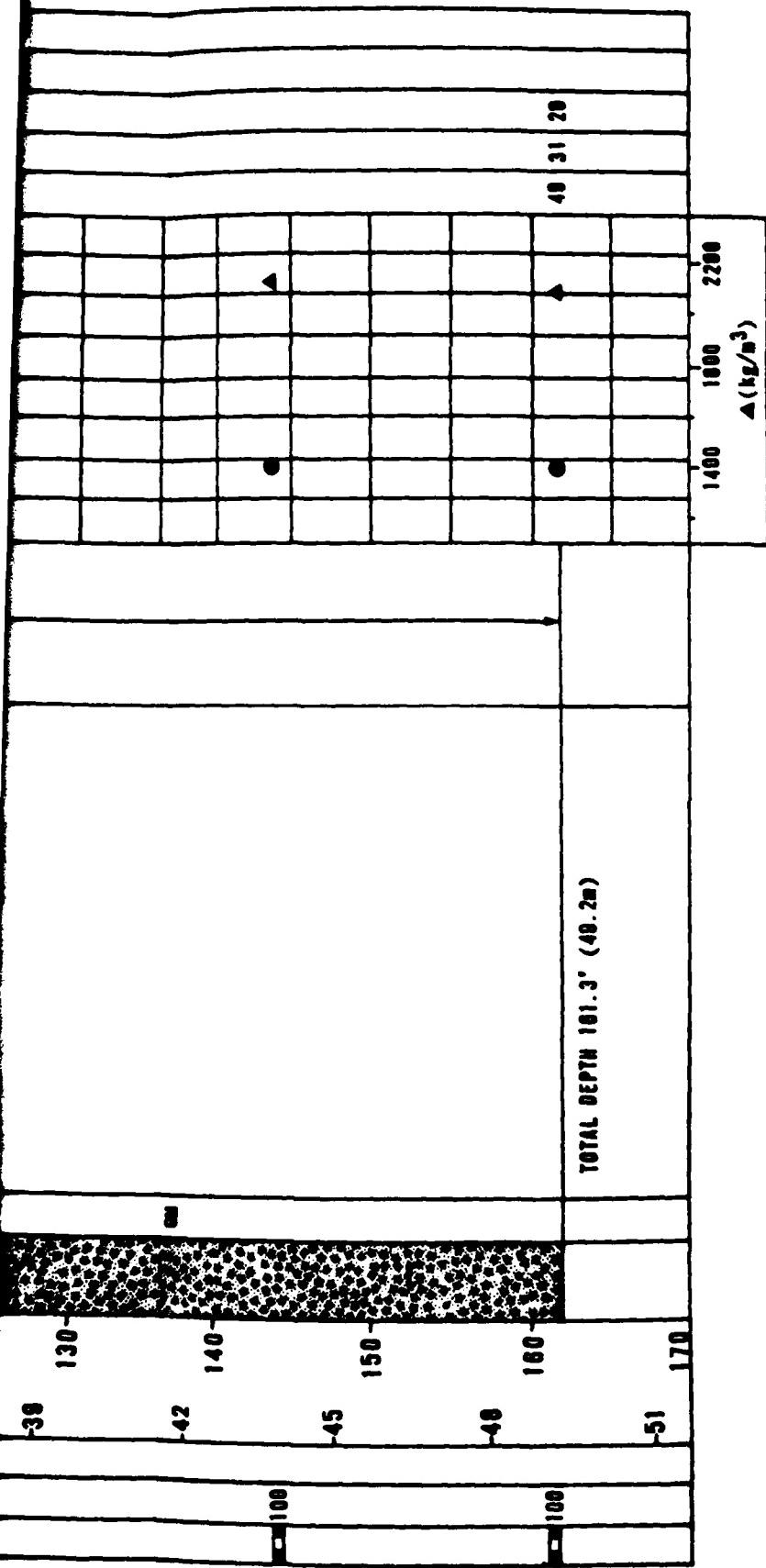
四庫全書



drill chart



2



LOG OF BORING BV-B-1  
VERIFICATION SITE, HANLON CDP, NEVADA

UR SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

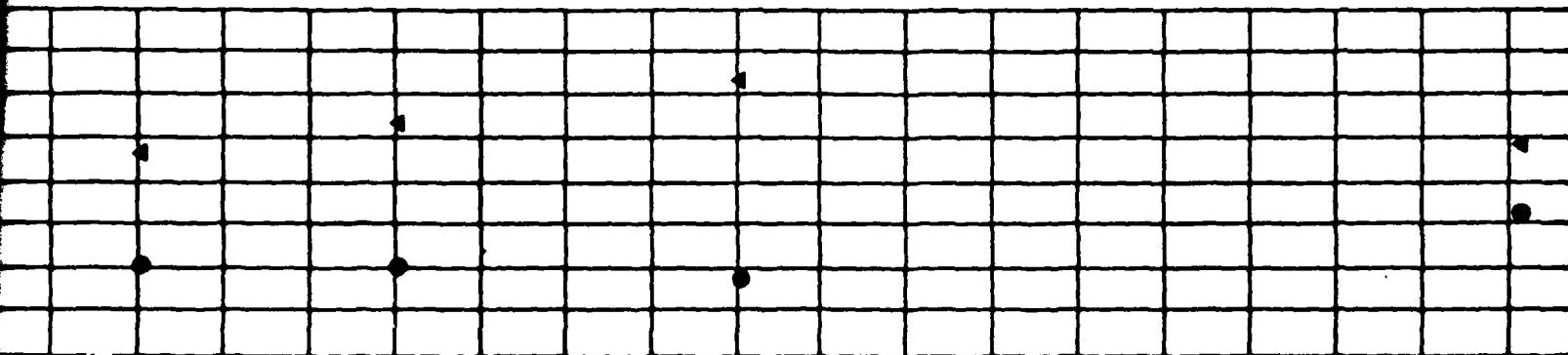
FIGURE  
B-1

FUGRO NATIONAL INC.

AFV-01



30 45 18



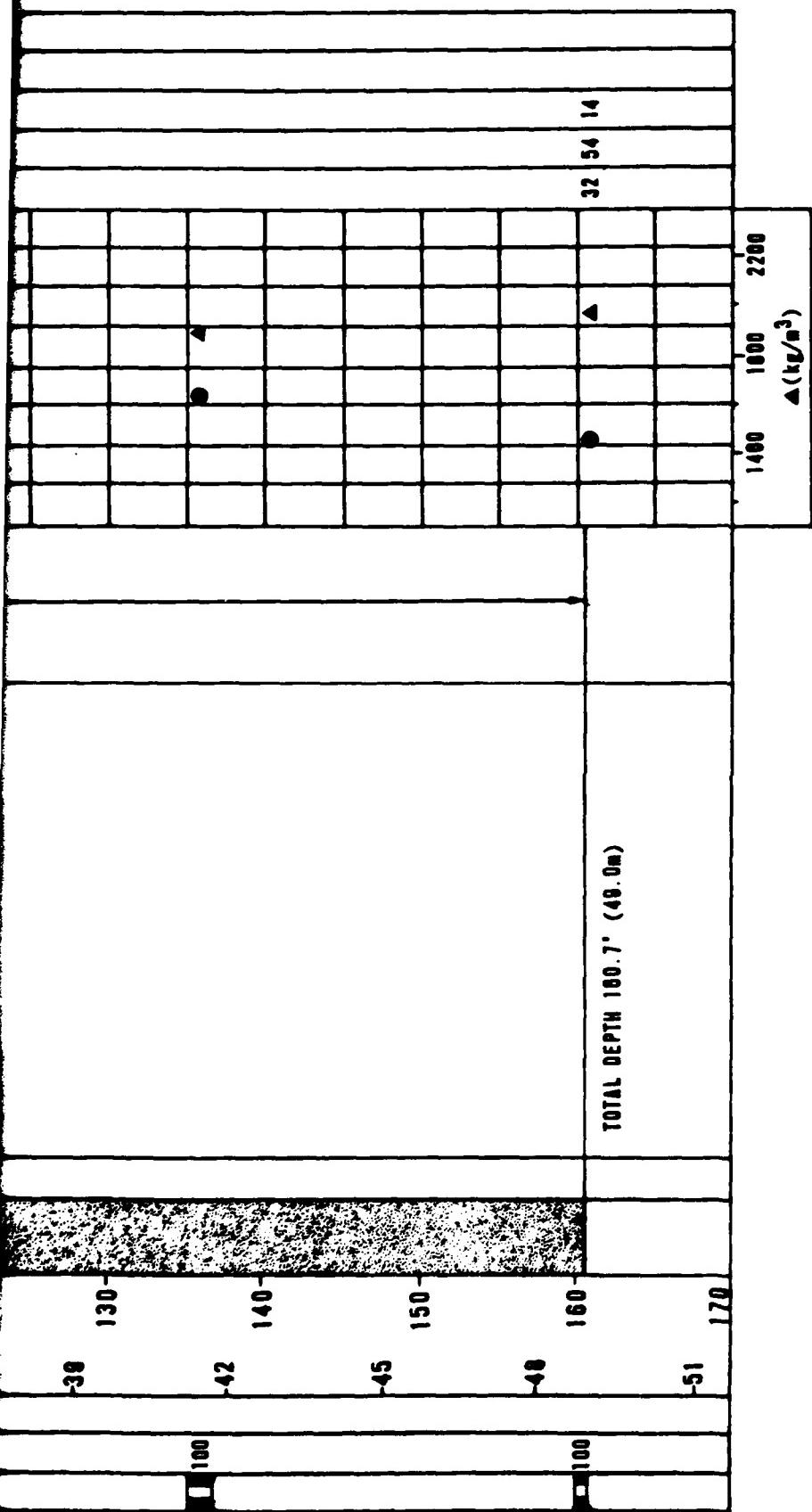
Irregular  
drill chatter

SW

50 60 70 80 90 100 110 120 130  
-15 -18 -21 -24 -27 -30 -33 -36 -39

-100 -100 -100

2  
-  
1



#### EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

LOG OF BORING NV-B-2  
VERIFICATION SITE, HANLIN COR, NEVADA

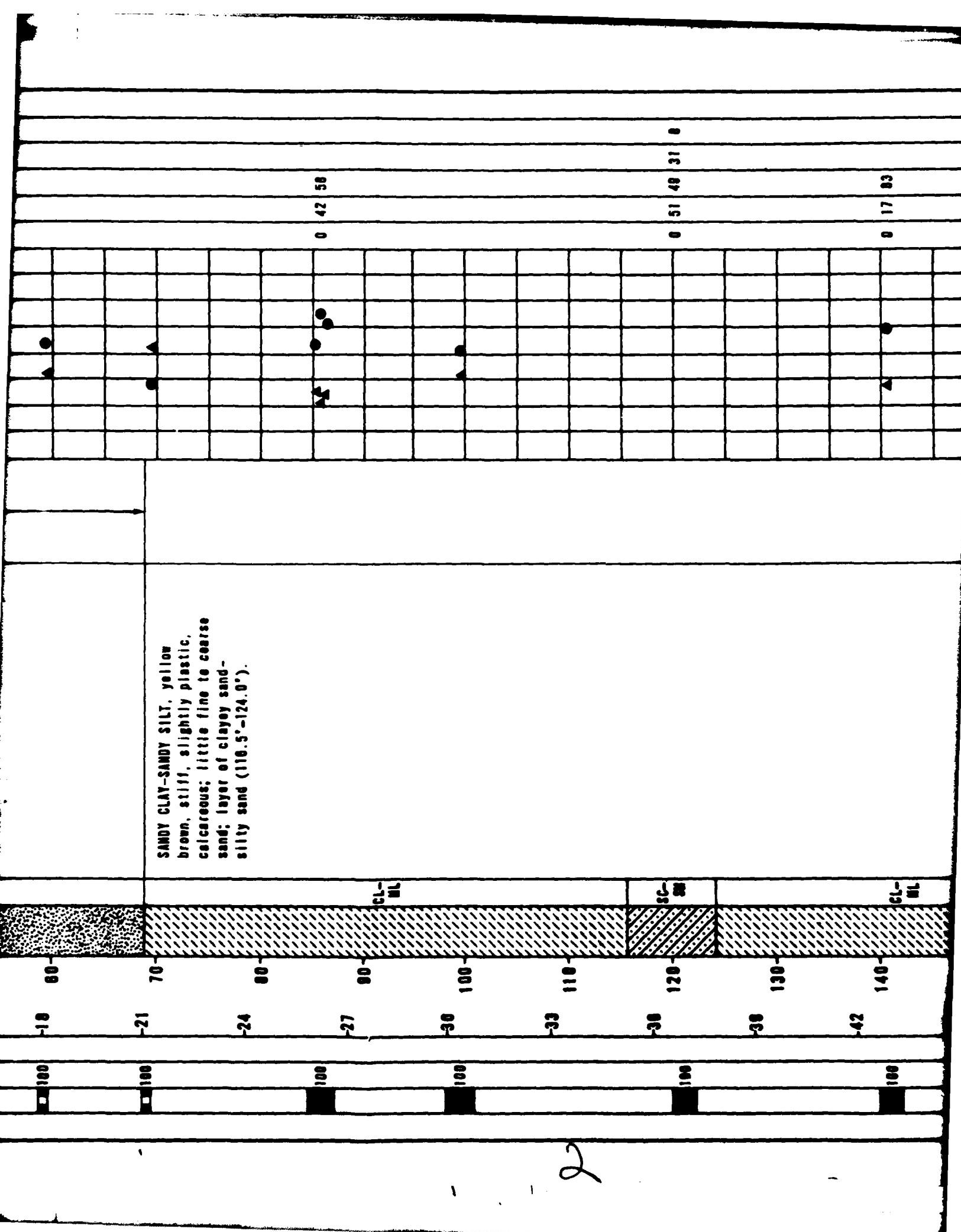
ON SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAUSO

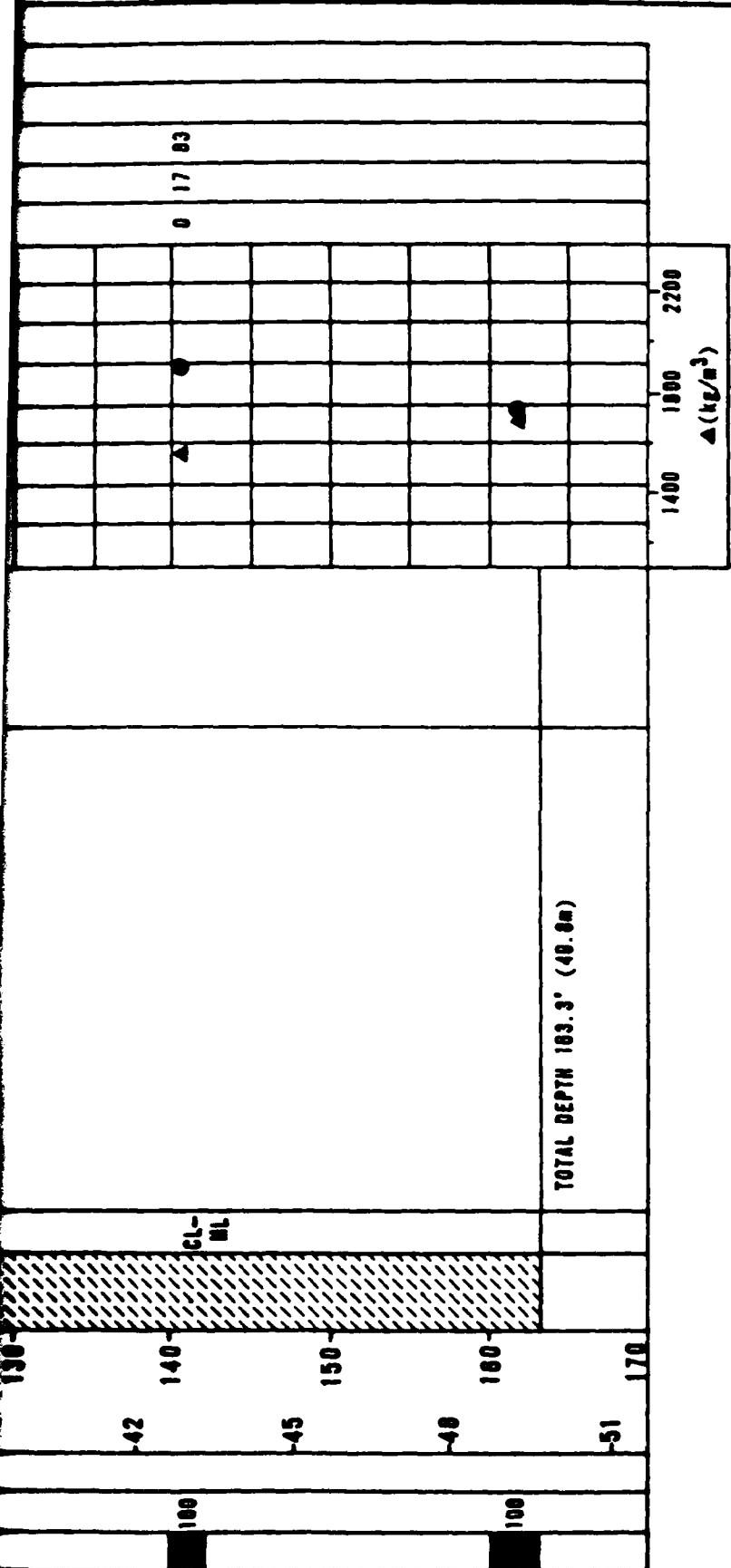
FIGURE  
B-2

FUGRO NATIONAL INC.

APR

SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS										GRANULARITY								
		5	10	15	20	25	30	35	GR	SA	FI	LL	PI	10	50	100	110	120	130	140
GRAVELLY SAND, light brown to brown, fine to coarse, poorly graded, medium dense to very dense, angular to subrounded, calcareous; some fine gravel; trace to little silt; layer of sandy gravel (0.0'-2.0'); layer of silty sand (2.0'-4.0').		●	●	●	●	●	●	●	40	55	5	14	14	30	30	1	60	33		
SILTY SAND, brown, fine to coarse, poorly graded, dense, subangular to subrounded, calcareous; little silt; trace fine gravel.	irregular drill chatter								24	62	14	20	9	72	19	7	73	20		
GRAVELLY SAND, yellow brown to gray brown, fine to coarse, poorly graded, medium dense to very dense, angular to subrounded, calcareous; little fine to coarse gravel; trace silt.																			14	80
		SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	
DEPTH FEET	0	0	3	10	18	25	32	40	48	55	62	70	78	85	92	100	108	115	122	130
DEPTH METERS	0	0	3	10	18	25	32	40	48	55	62	70	78	85	92	100	108	115	122	130
N VALUE	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
S RECOVERY	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
SAMPLE TYPE	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■





#### EXPLANATION

- FUGRO DRIVE SAMPLE
  - BULK SAMPLE
  - PITCHER TUBE SAMPLE
  - STANDARD PENETRATION TEST SAMPLE
  - CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE  
 ▲ - DRY UNIT WEIGHT (ASTM: D-2837-71)  
 ● - MOISTURE CONTENT (ASTM: D-2216-71)  
 NR - NO RECOVERY

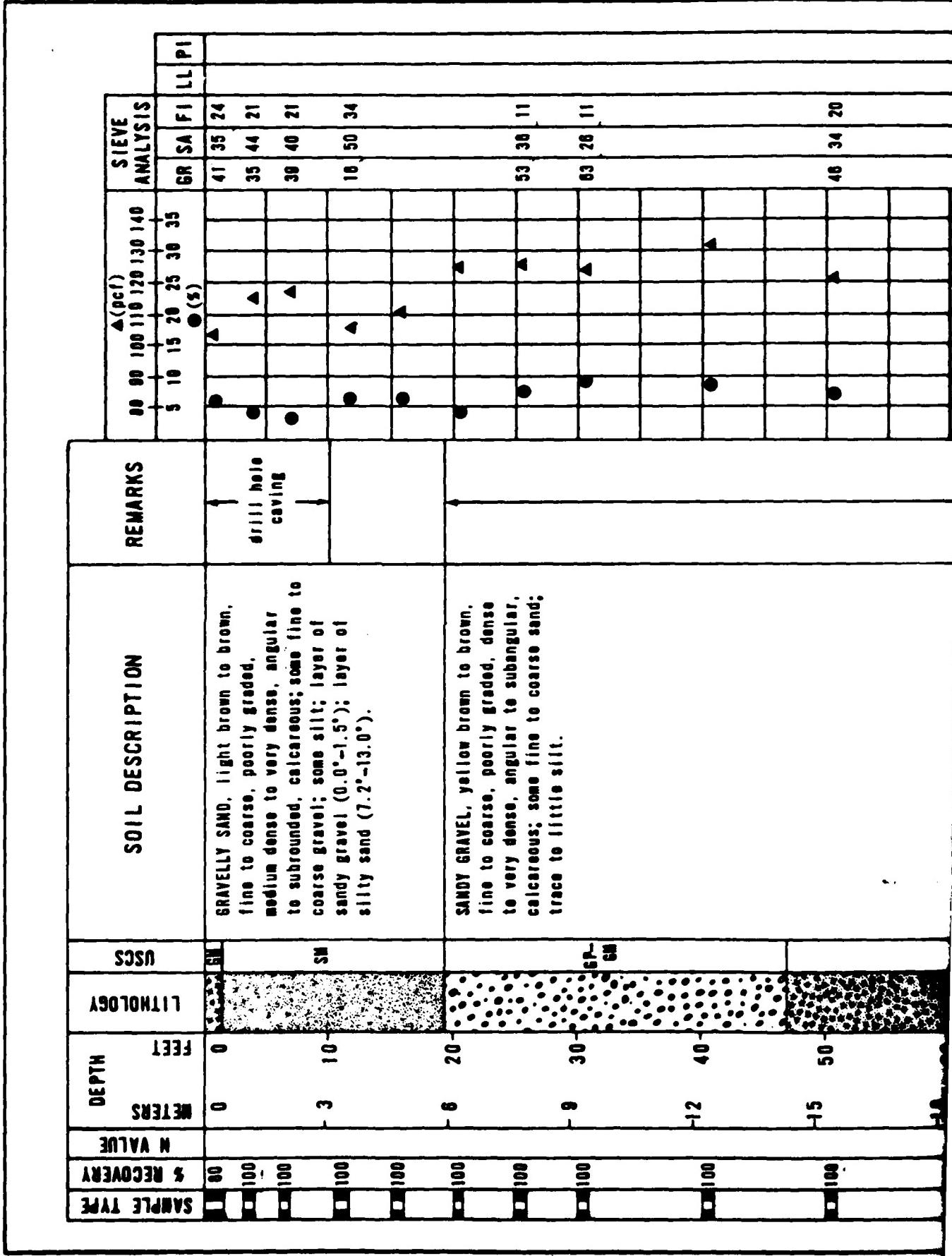
LOG OF BORING EV-B-3 VERIFICATION SITE, HANLIN CDP, NEVADA		FIGURE B-3
UX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - SAMSO		

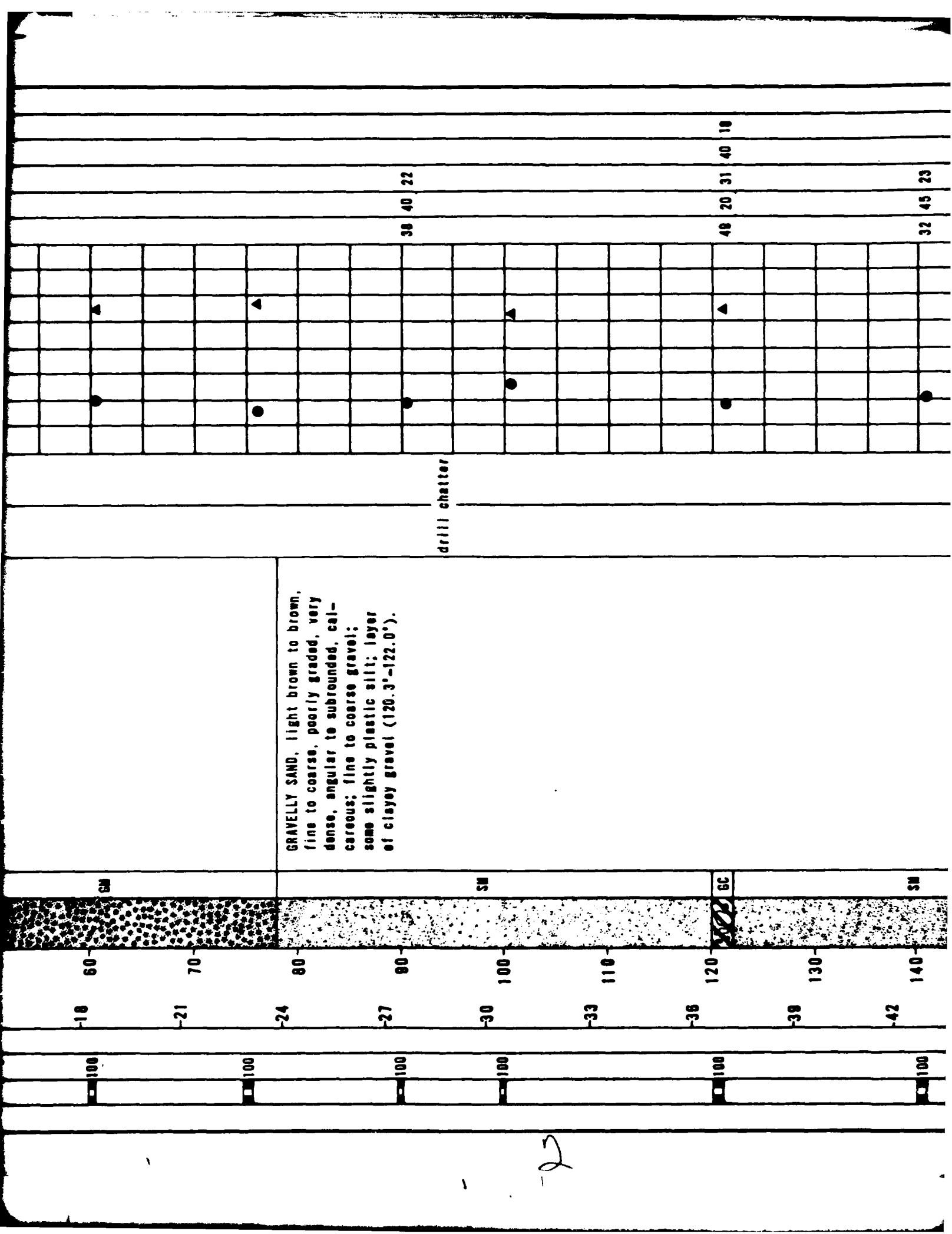
FUGRO NATIONAL INC.

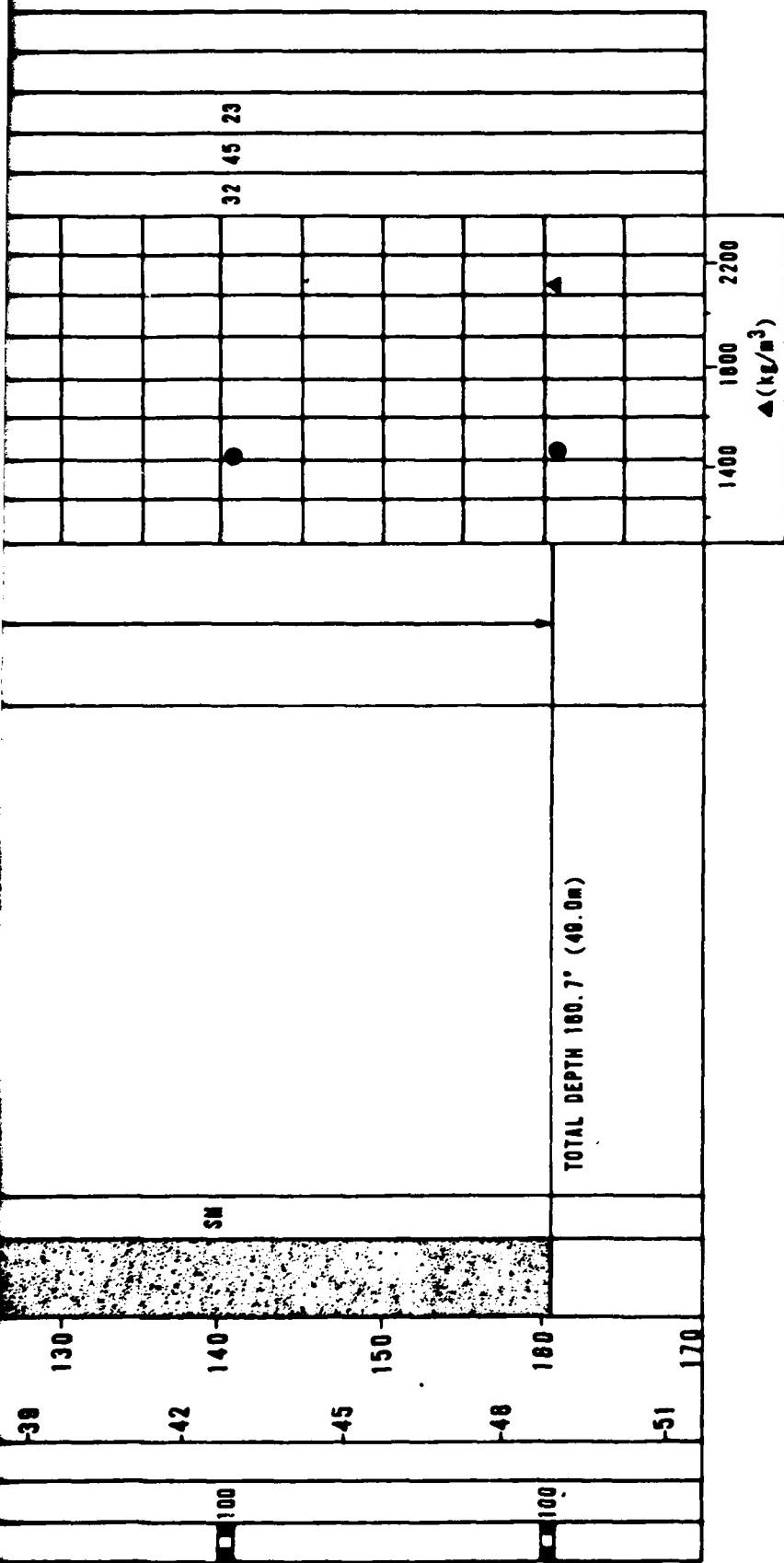
AFV-88

Approved by \_\_\_\_\_

Concluded at \_\_\_\_\_







#### EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

LOG OF BORING NV-B-4 VERIFICATION SITE, HAMLIN CDP, NEVADA		FIGURE 8-4
NU SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - SAMSO		

FUGRO NATIONAL, INC. 3 AFV-88

APPROVED BY \_\_\_\_\_  
RECORDED BY \_\_\_\_\_

SAMPLE TYPE	S RECOVERY	N VALUE	METERS	FEET	DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS					
										100	80	60	40	20	10
-	-	-	0	0	0	SILTY SAND	SC	Light brown to brown, fine to coarse, poorly graded, medium dense, subangular to subrounded, calcareous; some slightly plastic silt; trace to little fine to coarse gravel.		100	80	60	40	20	10
-	-	-	3	10	3	SANDY CLAY	CL	Brown, stiff, medium plastic, calcareous; some fine to coarse sand; layer of sandy silt (14.0°).		100	80	60	40	20	10
-	-	-	6	20	6	SILTY SAND	SC	Light brown to brown fine to coarse, poorly graded, medium dense to very dense, angular to rounded, calcareous; little nonplastic to medium plastic silt; trace to little fine to coarse gravel; layer of clayey gravel (40.0°-43.0°); layer of clayey sand (47.5°-54.0°); lenses of gravelly sand throughout.		100	80	60	40	20	10
-	-	-	9	30	9	SILTY SAND	SC			100	80	60	40	20	10
-	-	-	12	40	12	SILTY SAND	SC			100	80	60	40	20	10
-	-	-	15	50	15	SILTY SAND	SC			100	80	60	40	20	10

12 54 34 47 19

11  
10

0 07 27

20

2

4

2

2

Irregular  
drill chatter

TOTAL DEPTH 123.3' (37.6m)

SW

60

70

80

90

100

110

120

130

140

-18

-21

-24

-27

-30

-33

-36

-39

-42

100

100

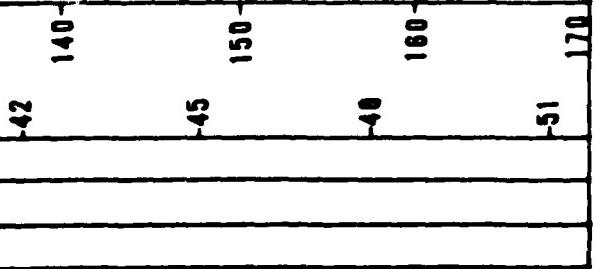
100

100

100

100

2



1400 1600 1800 2000  
▲ (kg/m<sup>3</sup>)

#### EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N - STANDARD PENETRATION RESISTANCE  
 ▲ - DRY UNIT WEIGHT (ASTM: D-2837-71)  
 ● - MOISTURE CONTENT (ASTM: D-2216-71)  
 NR - NO RECOVERY

LOG OF BORING NV 3-5,  
 VERIFICATION SITE, HANLIN CRP, NEVADA

ME SITING INVESTIGATION  
 DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
 8-5

FUGRO NATIONAL INC.

AFV-68

#### BORING DETAILS

EL E V A T I O N	: 5945' (1812m)
S U R F I C I A L G E O L O G I C U N I T	: A51/A40
D A T E D R I L L E D	: 20 November 1978
D R I L L I N G M E T H O D	: Rotary Wash
H O L E D I A M E T E R	: 4 7/8" (124mm)
W A T E R L E V E L	: Not Encountered

CALCULUS OF VARIATIONS

22 40 38 46 16

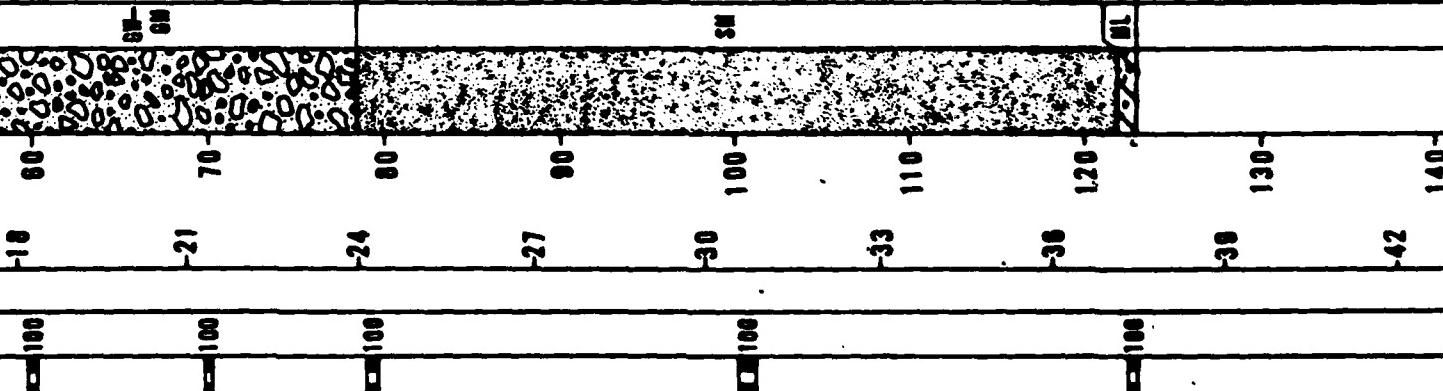
17 57 26

4 24 72

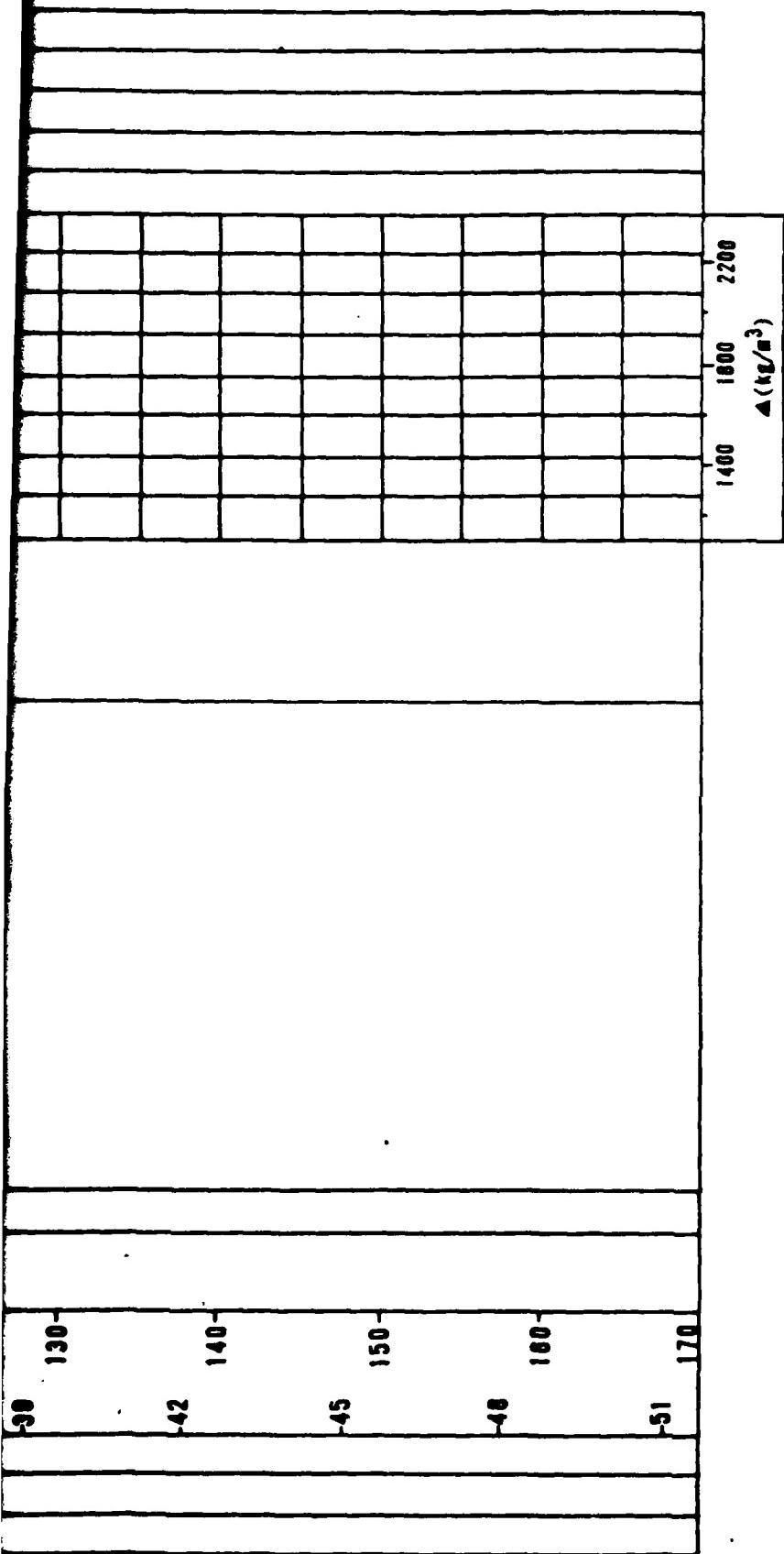
drill chatter

SILTY SAND, light brown to brown, fine to coarse, poorly graded, very dense, angular to subrounded, calcareous; some slightly to medium plastic silt; layer of sandy silt (122.0'-123.0').

TOTAL DEPTH 123.0' (37.5m)



4



#### EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

LOG OF BORING NY-B-8, VERIFICATION SITE, HANLIN CDP, NEVADA	
UX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - SAUSO	FIGURE B-8
FUGRO NATIONAL INC.	

3

**SECTION 7.0**  
**TRENCH AND TEST PIT LOGS**

FN-TR-27-IV

EXPLANATIONS OF TRENCH AND TEST PIT LOGS

See Section 6.0, "Boring Logs", for explanations.

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_

BULK SAMPLE	DEPTH	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
	METERS						GR	SA	FI	LL	PI
	0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; some nonplastic silt; little fine gravel		13	80	27		NP
	2				SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse subangular to subrounded sand; little silt; occasional cobbles to 8" size (11.0"-14.0").						
	4			dense		vertical walls stable					
	6		SM								
	8										
	10										
	12			very dense							
	14				TOTAL DEPTH 14.0' (4.3m)						
	16										
	18										
	20										

TRENCH DETAILS

SURFACE ELEVATION : 5875' (1730m)  
 DATE EXCAVATED : 14 NOVEMBER 1978  
 SURFICIAL GEOLOGIC UNIT: ASy/AS1  
 TRENCH LENGTH : 15.0' (4.6m)  
 TRENCH ORIENTATION : E-W

LOG OF TRENCH HV-T-1  
VERIFICATION SITE, HAMLIN CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
7-1

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS					
							GR	SA	FI	LL	PI	
	0 0				GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse gravel; little to some silt; stage II caliche (0.3'-3.0'); stage I caliche (3.0'-10.0').					35	42	23
	2											
	-1			dense								
	4											
	6											
	8			SM								
	10			very dense								
	-3				TOTAL DEPTH 10.0' (3.0m)							
	10											
	12											
	14											
	16											
	18											
	20											

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_**TRENCH DETAILS**

SURFACE ELEVATION : 5785' (1763m)  
 DATE EXCAVATED : 16 NOVEMBER 1978  
 SURFICIAL GEOLOGIC UNIT : A5y/A5i  
 TRENCH LENGTH : 15.0' (4.6m)  
 TRENCH ORIENTATION : NW-SE

**LOG OF TRENCH HV-T-2**  
**VERIFICATION SITE, HAMLIN CDP, NEVADA**

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - SAMSO	FIGURE 7-2
--	---------------

**FUGRO NATIONAL, INC.**

CHECKED BY \_\_\_\_\_ APPROVED BY \_\_\_\_\_

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0	0			CLAYEY SAND, brown, fine to coarse, poorly graded, slightly moist, sub-angular to subrounded, calcareous; some slightly plastic clay; trace fine to coarse gravel; stage II caliche (1.0'-2.0'); stage I caliche (2.0'-4.0')		10	81	28	30	9
	2		SC								
	4			medium dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, sub-angular, calcareous; some fine to coarse gravel; little silt.	vertical walls stable					
	6										
	8										
	10		SM								
	12			dense							
	14				TOTAL DEPTH 14.0' (4.3m)						
	16										
	18										
	20										

**TRENCH DETAILS**

SURFACE ELEVATION : 5845' (1812m)  
 DATE EXCAVATED : 17 NOVEMBER 1978  
 SURFICIAL GEOLOGIC UNIT : A51/A4e  
 TRENCH LENGTH : 14.0' (4.3m)  
 TRENCH ORIENTATION : E-W

**LOG OF TRENCH HV-T-3  
VERIFICATION SITE, HAMLIN COP., NEVADA**

 MX SITING INVESTIGATION  
 DEPARTMENT OF THE AIR FORCE - SAMSO

 FIGURE  
 7-3

**FUGRO NATIONAL, INC.**

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0				SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, angular to subrounded, calcareous; little to some silt, slightly plastic (0.0"-2.0"); trace fine to coarse gravel; stage II caliche (1.0"-3.0")		7	85	28		
	2		SM	medium dense							
	4										
	6				SANDY SILT, light brown, slightly moist, slightly plastic, calcareous; little fine to coarse sand.		0	19	81		
	8		ML	stiff							
	10				GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse gravel; little silt; stage I caliche.						
	12		SM	dense							
	14				TOTAL DEPTH 14.0' (4.3m)						
	16										
	18										
	20										

TRENCH DETAILS

SURFACE ELEVATION : 5980' (1823m)  
 DATE EXCAVATED : 17 NOVEMBER 1978  
 SURFICIAL GEOLOGIC UNIT : A51/A46  
 TRENCH LENGTH : 14.0' (4.3m)  
 TRENCH ORIENTATION : NW-SE

**LOG OF TRENCH HV-T-4**  
**VERIFICATION SITE, HAMLIN CDP, NEVADA**

MX SITING INVESTIGATION  
 DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
 7-4

FUGRO NATIONAL, INC.

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
								GR	SA	FI	LL	PI
	0	0			medium dense	SOLTY SAND, brown, fine to coarse, poorly graded, slightly moist, angular to subrounded, calcareous; little to some silt; little fine to coarse gravel; stage III caliche (1.0'-4.0').	vertical walls stable	15	58	27		
		2		SM	very dense							
		4				TOTAL DEPTH 4.0' (1.2m)	cementation at 4.0' exceeded capacity of Case 580C backhoe					
		6										
		8										
		10										
		12										
		14										
		16										
		18										
		20										

**TRENCH DETAILS**

SURFACE ELEVATION : 8240' (1802m)  
 DATE EXCAVATED : 18 NOVEMBER 1978  
 SURFICIAL GEOLOGIC UNIT : A51  
 TRENCH LENGTH : 12.0' (3.7m)  
 TRENCH ORIENTATION : N-S

2 JUL 78

**LOG OF TRENCH HV-T-5**  
**VERIFICATION SITE, HAMLIN COP, NEVADA**

 MX SITING INVESTIGATION  
 DEPARTMENT OF THE AIR FORCE - SAMSO

 FIGURE  
 7-5

**FUGRO NATIONAL, INC.**

AFV-04

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FUGRO NATIONAL INC LONG BEACH CA  
MX SITING INVESTIGATION. GEOTECHNICAL EVALUATION. VOLUME IV. NE--ETC(U)  
AUG 79  
FN-TR-27-VOL-4

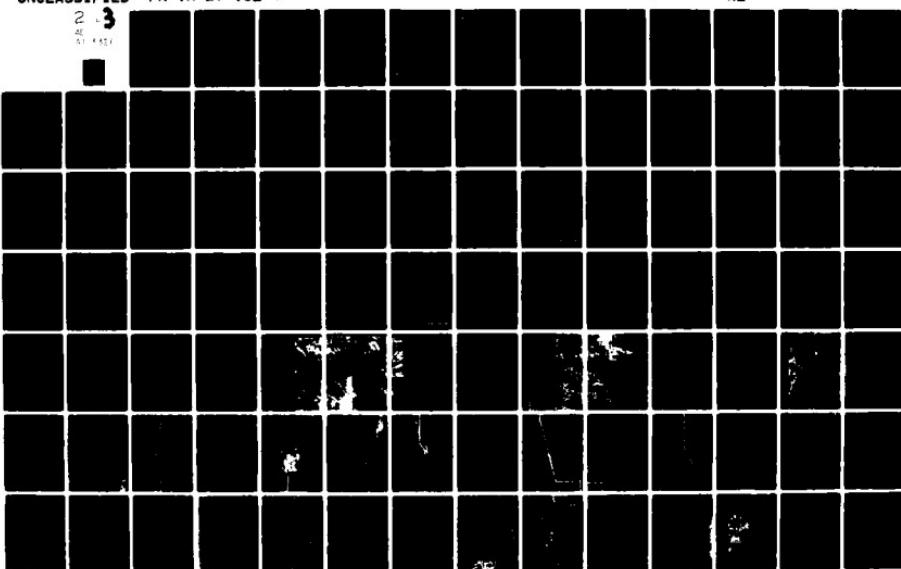
F/G 8/12

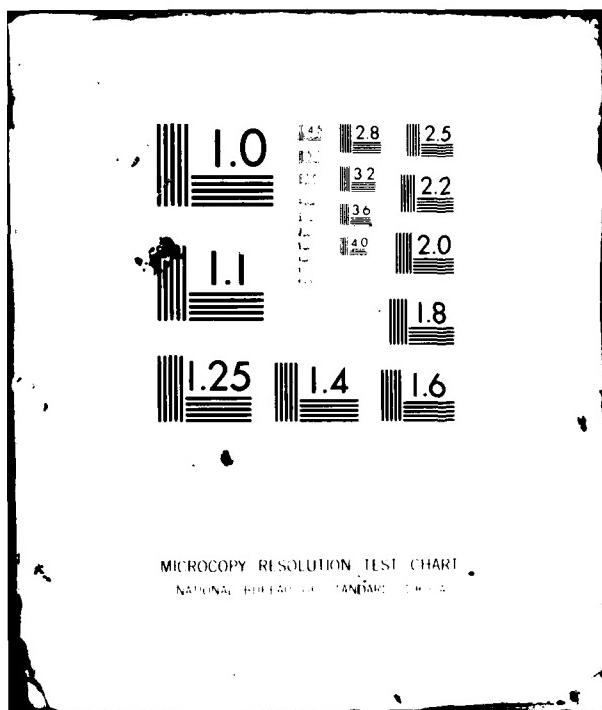
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MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963

Approved by  
CONTRACTOR

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0		SM	medium dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, sub-angular to subrounded, calcareous; little fine to coarse gravel; little silt; layer of silty sand (0.0'-1.5'); stage II caliche (1.5'-2.5'); stage I caliche (2.5'-3.5').	vertical walls stable	7	74	18		NP
	2										
	4										
	6		SP-SM	medium dense							
	8										
	10										
	12		GP	dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, angular to subrounded, calcareous; some fine to coarse subangular to subrounded sand; occasional cobbles to 8" size.						
	14				TOTAL DEPTH 14.0' (4.3m)						
	16										
	18										
	20										

TRENCH DETAILS

SURFACE ELEVATION : 8145' (1873m)  
 DATE EXCAVATED : 19 NOVEMBER 1978  
 SURFICIAL GEOLOGIC UNIT : ASI  
 TRENCH LENGTH : 15.0' (4.6m)  
 TRENCH ORIENTATION : E-W

**LOG OF TRENCH HV-T-8**  
**VERIFICATION SITE, HAMLIN COP. NEVADA**

HV SITING INVESTIGATION  
 DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
 7-8

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	F1	LL	PI
	0 0				SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some silt; little fine gravel.		14	64	22		NP
	2		SM	medium dense							
	4				SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse sand; trace silt; stage II caliche (3.5'-4.5'); occasional cobbles to 5" size.						
	6										
	8										
	10		GP-GM	dense							
	12										
	14				TOTAL DEPTH 14.0' (4.3m)						
	16										
	18										
	20										

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_TRENCH DETAILS

SURFACE ELEVATION : 9880' (1788m)  
 DATE EXCAVATED : 20 NOVEMBER 1978  
 SURFICIAL GEOLOGIC UNIT : ASI/ASy  
 TRENCH LENGTH : 15.0' (4.6m)  
 TRENCH ORIENTATION : N-8

**LOG OF TRENCH HV-T-7**  
**VERIFICATION SITE, HAMLIN CDP, NEVADA**

MX SITING INVESTIGATION  
 DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
 7-7

FUGRO NATIONAL, INC.

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
								GR	SA	FI	LL	PI
	0	0			loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, sub-angular, calcareous; some silt; trace fine gravel; stage II caliche (1.0"-2.0").	vertical walls stable	6	73	21		
	2			SM								
	1											
	4											
	6											
	8											
	2											
	10											
	12											
	14											
	16											
	18											
	20											
						TOTAL DEPTH 14.0' (4.3m)						

**TRENCH DETAILS**

SURFACE ELEVATION : 5740' (1750m)  
 DATE EXCAVATED : 20 NOVEMBER 1978  
 SURFICIAL GEOLOGIC UNIT : A2  
 TRENCH LENGTH : 15.0' (4.5m)  
 TRENCH ORIENTATION : N-S

**LOG OF TRENCH HV-T-8**  
**VERIFICATION SITE, HAMLIN CDP, NEVADA**

MX SITING INVESTIGATION  
 DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
 7-8

**FUGRO NATIONAL, INC.**

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0 0			medium dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist to dry, angular to subangular, calcareous; some fine to coarse gravel; little silt; occasional cobbles to 5" size (5.0'-10.0'); stage III caliche (0.5'-2.0').	vertical walls stable	40	46	14		
	2			dense							
-1	4		SM								
-2	6										
-3	8			very dense							
	10				TOTAL DEPTH 10.0' (3.0m)						
	12					soil strength exceeded capacity of Case 580C backhoe at 10.0'					
-4	14										
-5	16										
-6	18										
	20										

**TRENCH DETAILS**

SURFACE ELEVATION : 8160' (1870m)  
 DATE EXCAVATED : 20 NOVEMBER 1978  
 SURFICIAL GEOLOGIC UNIT : ASI  
 TRENCH LENGTH : 15.0' (4.6m)  
 TRENCH ORIENTATION : N-S

**LOG OF TRENCH HV-T-9**  
**VERIFICATION SITE, HAMLIN COP, NEVADA**

MX SITING INVESTIGATION  
 DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
 7-9

**FUGRO NATIONAL, INC.**

## TRENCH DETAILS

**SURFACE ELEVATION** : 9830' (1718m)  
**DATE EXCAVATED** : 21 NOVEMBER 1978  
**SURFICIAL GEOLOGIC UNIT**: ASI  
**TRENCH LENGTH** : 14.0' (4.3m)  
**TRENCH ORIENTATION** : N-S

LOG OF TRENCH HV-T-10  
VERIFICATION SITE, HAMLIN CDP, NEVADA

**MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO**

2 JUL 79

**FUGRO NATIONAL, INC.**

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0 0			loose	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse sand; trace silt; occasional cobbles to 5" size (2.0"-5.0").						
	2			medium dense		light caving	56	34	10		
	4		GP-GM								
	6										
	8										
	10										
	12										
	14				TOTAL DEPTH 14.0' (4.3m)						
	16										
	18										
	20										

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_**TRENCH DETAILS**

SURFACE ELEVATION : 5700' (1737m)  
 DATE EXCAVATED : 21 NOVEMBER 1978  
 SURFICIAL GEOLOGIC UNIT: A5I  
 TRENCH LENGTH : 15.0' (4.6m)  
 TRENCH ORIENTATION : N-S

2 JUL 78

LOG OF TRENCH HV-T-11  
VERIFICATION SITE, HAMLIN CDP, NEVADA

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - SAMSO	FIGURE 7-11
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**FUGRO NATIONAL, INC.**

AFY-04

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0 0				SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some silt.						
	1		SM	medium dense							
	2										
	3		SM	dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little fine to coarse rounded gravel; little silt; stage I caliche (2.0'-4.25'); layer of sandy gravel (4.5'-5.0').						
	4										
	5	GM	GM	dense							
TOTAL DEPTH 5.0' (1.5m)											

SURFACE ELEVATION: 5480' (1664m)  
SURFICIAL GEOLOGIC UNIT: A4e

## LOG OF TEST PIT HV-P-1

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0 0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt; some fine to coarse subrounded to subangular gravel.						
	1										
	2		GM	dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little fine to coarse sand; trace to little silt; occasional cobbles to 7" size.						
	3										
	4										
	5										
TOTAL DEPTH 5.0' (1.5m)											

SURFACE ELEVATION: 5820' (1774m)  
SURFICIAL GEOLOGIC UNIT: ASI

## LOG OF TEST PIT HV-P-2

LOGS OF TEST PITS HV-P-1 AND HV-P-2  
VERIFICATION SITE, HAMLIN COP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-12

FUGRO NATIONAL, INC.

AFV-03

SOIL SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0 0				SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded calcareous; little fine to coarse sand; little silt; occasional cobbles to 6" size, stage III caliche (1.5"-2.5").						
	1		GM	very dense							
	2										
	3				TOTAL DEPTH 2.5' (0.8m)						
	4					cementation exceeded capacity of Case 580C backhoe at 2.5'					
	5										

SURFACE ELEVATION: 8200' (1890m)

SURFICIAL GEOLOGIC UNIT: ASI

## LOG OF TEST PIT HV-P-3

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_

	0 0		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded; calcareous; little silt; trace fine subrounded to angular gravel.						
	1				SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse sand; little silt; occasional cobbles to 7" size; stage II caliche.						
	2		GM	very dense							
	3										
	4										
	5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 8220' (1890m)

SURFICIAL GEOLOGIC UNIT: ASy/ASI

## LOG OF TEST PIT HV-P-4

LOGS OF TEST PITS HV-P-3 AND HV-P-4  
VERIFICATION SITE, HAMLIN CDP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-13

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0 0		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt; trace fine subrounded to angular gravel.						
	1				SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, subrounded to subangular, calcareous; some fine to coarse sand; little silt; occasional cobbles to 8" size; stage I caliche.						
	2										
	3		GM	very dense							
	4										
	5					TOTAL DEPTH 5.0' (1.5m)					

SURFACE ELEVATION: 5970' (1820m)

SURFICIAL GEOLOGIC UNIT: ASy/ASI

## LOG OF TEST PIT HV-P-5

APPROVED BY \_\_\_\_\_

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0 0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some silt; trace fine subangular to subrounded gravel.						
	1				SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subrounded to angular, calcareous; some fine to coarse sand; little silt; stage II caliche.						
	2										
	3		GM	dense							
	4										
	5					TOTAL DEPTH 5.0' (1.5m)					

SURFACE ELEVATION: 6120' (1865m)

SURFICIAL GEOLOGIC UNIT: ASy

## LOG OF TEST PIT HV-P-6

LOGS OF TEST PITS HV-P-5 AND HV-P-6  
VERIFICATION SITE, HAMLIN CDP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
T-14

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
								GR	SA	FI	LL	PI
	0	0			medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse gravel; some silt; occasional cobbles to 5" size (1.0"-5.0"); stage II caliche (1.0"-5.0").		23	55	22		
	1											
	2											
	3			SM	dense							
	4											
	5											
TOTAL DEPTH 5.0' (1.5m)												

SURFACE ELEVATION: 6070' (1850m)

SURFICIAL GEOLOGIC UNIT: A5y

## LOG OF TEST PIT HV-P-7

APPROVED BY \_\_\_\_\_

	0	0				SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt; trace fine subangular to subrounded gravel; stage II caliche.						
	1			SM	medium dense							
	2					GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little fine to coarse subrounded to subangular gravel; little silt; occasional cobbles to 5" size.						
	3											
	4											
	5											
TOTAL DEPTH 5.0' (1.5m)												

SURFACE ELEVATION: 6170' (1881m)

SURFICIAL GEOLOGIC UNIT: A5y/A4e

## LOG OF TEST PIT HV-P-8

LOGS OF TEST PITS HV-P-7 AND HV-P-8  
VERIFICATION SITE, HAMLIN COP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-15

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0 0		CL-ML	firm	SANDY CLAY-SANDY SILT, dark brown, slightly moist, slightly plastic; some fine to coarse sand.						
	1				SANDY CLAY, light brown, slightly moist, slightly plastic, calcareous; some fine to coarse sand; trace fine-subrounded gravel; stage II caliche						
	2										
	3		CL	firm							
	4										
	5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5920' (1804m)  
SURFICIAL GEOLOGIC UNIT: A5i/A4e

## LOG OF TEST PIT HV-P-9

0 0					CLAYEY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some slightly plastic clay; trace fine gravel; stage I caliche (0.8'-3.0').						
1			SC	medium dense							
2											
3					SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little slightly plastic silt.						
4			SM	dense							
5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5905' (1800m)  
SURFICIAL GEOLOGIC UNIT: A5i/A4e

## LOG OF TEST PIT HV-P-10

LOGS OF TEST PITS HV-P-9 AND HV-P-10  
VERIFICATION SITE, HAMLIN CDP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-16

FUGRO NATIONAL, INC.

AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
								GR	SA	FI	LL	PI
	0	0				SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some silt; stage II caliche (1.0"-2.0").						
		1			medium dense							
		2										
		3				SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt; trace fine subangular gravel.						
	-1				dense							
		4										
		5										
TOTAL DEPTH 5.0' (1.5m)												

SURFACE ELEVATION: 6065' (1849m)  
SURFICIAL GEOLOGIC UNIT: A5i-A4o

## LOG OF TEST PIT HV-P-11

APPROVED BY \_\_\_\_\_

	0	0		SM	medium dense	SILTY SAND, dark brown, fine to medium, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt.						
		1				SILT, light brown, slightly moist, slightly plastic, calcareous.						
		2										
		3		ML	firm							
	-1											
		4										
		5										
TOTAL DEPTH 5.0' (1.5m)												

SURFACE ELEVATION: 5980' (1823m)  
SURFICIAL GEOLOGIC UNIT: A4o/A1

## LOG OF TEST PIT HV-P-12

LOGS OF TEST PITS HV-P-11 AND HV-P-12  
VERIFICATION SITE, HAMLIN COP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-17

FUGRO NATIONAL, INC.

AFV-03

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0 0			medium dense	SILTY SAND, light brown to brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some silt; trace fine to coarse gravel, stage I caliche (1.3"-4.5").						
	1										8 88 23
	2										
	3		SM	dense							
	4										
	5				TOTAL DEPTH 5.0" (1.5m)						

SURFACE ELEVATION: 6350' (1935m)  
SURFICIAL GEOLOGIC UNIT: ASI

## LOG OF TEST PIT HV-P-13

APPROVED BY \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

	0 0			medium dense	SILTY SAND, brown, fine to medium, poorly graded, slightly moist, subangular to subrounded, calcareous; some little slightly plastic silt.						
	1				SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt; trace fine subangular to subrounded gravel; stage I caliche.						
	2										
	3		SM	dense							
	4										
	5				TOTAL DEPTH 5.0" (1.5m)						

SURFACE ELEVATION: 6140' (1871m)  
SURFICIAL GEOLOGIC UNIT: ASI

## LOG OF TEST PIT HV-P-14

LOGS OF TEST PITS HV-P-13 AND HV-P-14  
VERIFICATION SITE, HAMEIN CDP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-18

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY GRAMS	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
								GR	SA	FI	LL	PI
	0	0				SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subrounded to subangular, calcareous; little silt; trace fine subangular to subrounded gravel (1.0'-3.0'); stage I caliche (1.5'-3.0'); trace fine to coarse gravel (3.0'-5.0'); occasional cobbles to 6" size (1.5'-5.0').						
	1											
	2											
	3			SM	medium dense							
	4											
	5						TOTAL DEPTH 5.0' (1.5m)					

SURFACE ELEVATION: 5980' (1817m)  
SURFICIAL GEOLOGIC UNIT: ASI

## LOG OF TEST PIT HV-P-15

APPROVED BY \_\_\_\_\_

	0	0				SILTY SAND, light brown to brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt; little fine gravel; occasional cobbles to 5" size 0.0'-1.0'); stage I caliche (2.5'-3.5').		13	68	19		
	1											
	2											
	3			SM	medium dense							
	4											
	5						TOTAL DEPTH 5.0' (1.5m)					

SURFACE ELEVATION: 6250' (1895m)  
SURFICIAL GEOLOGIC UNIT: ASI

## LOG OF TEST PIT HV-P-16

LOGS OF TEST PITS HV-P-15 AND HV-P-16  
VERIFICATION SITE, HAMLIN COP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-19

FUGRO NATIONAL, INC.

AFY-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
								BR	SA	FI	LL	PI
	0	0				GRAVELLY SAND, light brown to brown, fine to coarse, poorly graded, slightly moist, subangular to sub-rounded, calcareous; some fine to coarse gravel; little silt; stage I caliche (2.0'-3.0').		22	84	14		
		1			medium dense							
		2		SM								
		3			dense							
		4										
		5					TOTAL DEPTH 5.0' (1.5m)					

SURFACE ELEVATION: 5780' (1762m)  
SURFICIAL GEOLOGIC UNIT: A5i/A4e

## LOG OF TEST PIT HV-P-17

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_

	0	0				SANDY CLAY, light brown, slightly moist, slightly plastic; calcareous; some fine to coarse sand.		2	42	58	31	10
		1										
		2										
		3				SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse sand; little silt.						
		4		GM	dense							
		5					TOTAL DEPTH 5.0' (1.5m)					

SURFACE ELEVATION: 5785' (1757m)  
SURFICIAL GEOLOGIC UNIT: A4e/A1

## LOG OF TEST PIT HV-P-18

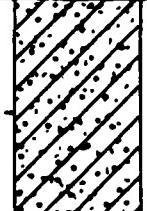
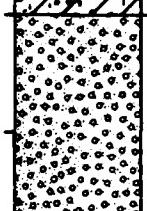
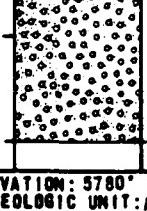
LOGS OF TEST PITS HV-P-17 AND HV-P-18  
VERIFICATION SITE, HAMLIN CDP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
T-20

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
								GR	SA	FI	LL	PI
	0	0				SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little silt; stage I caliche.						
		1										
		2										
		3										
		4										
		5										
TOTAL DEPTH 5.0' (1.5m)												

SURFACE ELEVATION: 5780' (1758m)  
SURFICIAL GEOLOGIC UNIT: ASy

## LOG OF TEST PIT HV-P-19

0	0		ML	firm	SANDY SILT, light brown, slightly moist, nonplastic, calcareous; some fine to medium sand.			0	38	82		
	1											
	2											
	3		GM-SM	dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse gravel; little silt.							
	4											
	5											
TOTAL DEPTH 5.0' (1.5m)												

SURFACE ELEVATION: 5780' (1758m)  
SURFICIAL GEOLOGIC UNIT: ASy

## LOG OF TEST PIT HV-P-20

LOGS OF TEST PITS HV-P-19 AND HV-P-20  
VERIFICATION SITE, HAMLIN COP, NEVADAMK SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-21 FUGRO NATIONAL, INC.

AFV-03

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							BR	SA	FI	LL	PI
	0 0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some silt; little fine subangular gravel.						
	1				SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse sand; little silt; stage I caliche (2.5'-3.5').						
	2										
	3		GM	dense							
	4										
	5										
TOTAL DEPTH 5.0' (1.5m)											

SURFACE ELEVATION: 5880' (1788m)

SURFICIAL GEOLOGIC UNIT: ASI

## LOG OF TEST PIT HV-P-21

APPROVED BY \_\_\_\_\_

0 0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some silt, little fine to coarse gravel.		20 58 21
1				SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, angular to subrounded, calcareous; some fine to coarse sand; little silt; occasional cobbles to 5" size; stage I caliche (0.0'-2.5').		
2						
3		GM	dense			
4						
5						
TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 8120' (1885m)

SURFICIAL GEOLOGIC UNIT: ASI/ASy

## LOG OF TEST PIT HV-P-22

LOGS OF TEST PITS HV-P-21 AND HV-P-22  
VERIFICATION SITE, HAMLIN CDP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-22

FUGRO NATIONAL, INC.

AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
								GR	SA	FI	LL	PI
	0	0				SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some silt; little fine to coarse gravel; stage I caliche (2.0'-2.5').						
		1			medium dense							
		2										
		3		SM								
		4			dense							
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5740' (1750m)  
SURFICIAL GEOLOGIC UNIT: ASy/ASi

## LOG OF TEST PIT HV-P-23

CHECKED BY \_\_\_\_\_ APPROVED BY \_\_\_\_\_

	0	0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some silt; trace fine gravel.		11	68	23		
		1				SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse sand; little silt; stage III caliche (1.0'-2.0').						
		2										
		3		GM	dense							
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6180' (1884m)  
SURFICIAL GEOLOGIC UNIT: ASI

## LOG OF TEST PIT HV-P-24

LOGS OF TEST PITS HV-P-23 AND HV-P-24,  
VERIFICATION SITE, HAMLIN COP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-23

FUGRO NATIONAL, INC.

AFV-03

BULK SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							OR	SA	FI	LL	PI
	0 0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some silt; trace fine gravel.						
	1				SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; some fine to coarse sand; little silt; occasional cobbles to 5" size; stage III caliche (1.0"-2.0").						
	2										
	3		GM	dense							
	4										
	5										
TOTAL DEPTH 5.0" (1.5m)											

SURFACE ELEVATION: 6480' (1969m)  
SURFICIAL GEOLOGIC UNIT: AS1

## LOG OF TEST PIT HV-P-25

APPROVED BY \_\_\_\_\_

	0 0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; little silt; trace fine sub-angular gravel.						
	1				SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse, subangular sand; little silt; occasional cobbles to 6" size.						
	2										
	3		GM	dense							
	4										
	5										
TOTAL DEPTH 5.0" (1.5m)											

SURFACE ELEVATION: 5805' (1708m)  
SURFICIAL GEOLOGIC UNIT: ASy/AS1

## LOG OF TEST PIT HV-P-26

LOGS OF TEST PITS HV-P-25 AND HV-P-26  
VERIFICATION SITE, HAMLIN COP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-24

FURRO NATIONAL, INC.

AFY-03

SOIL SAMPLE	DEPTH METERS FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS				
							GR	SA	FI	LL	PI
	0 0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, calcareous; little silt; trace fine gravel.						
	1				SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some fine to coarse subangular sand; stage I caliche (0.5'-1.0').						
	2										
	3		GM	medium dense							
	4										
	5					TOTAL DEPTH 5.0' (1.5m)					

SURFACE ELEVATION: 5820' (1774m)  
SURFICIAL GEOLOGIC UNIT: A5y/A5i

## LOG OF TEST PIT HV-P-27

APPROVED BY \_\_\_\_\_  
CHECKED BY \_\_\_\_\_

	0 0				SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; little silt; trace fine subangular gravel (0.0'-4.0'); some fine to coarse subangular gravel (4.0'-5.0'); stage II caliche (0.5'-2.5').						
	1										
	2			medium dense							
	3										
	4		SM								
	5			dense							
					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5800' (1707m)  
SURFICIAL GEOLOGIC UNIT: A5i

## LOG OF TEST PIT HV-P-28

LOGS OF TEST PITS HV-P-27 AND HV-P-28  
VERIFICATION SITE, HAMLIN CDP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOFIGURE  
7-25

FUGRO NATIONAL, INC.

**SECTION 8.0**  
**SURFICIAL SAMPLE LOGS**

EXPLANATIONS OF SURFICIAL SAMPLE LOGS

Finalized logs of the surficial samples are presented in this section. The explanations provided here are to serve as general guidelines to reading the logs.

A. Designations - Surficial samples are identified as follows:

SE-CS-1

SE - abbreviation for the site (e.g., SE - Snake East)

CS - abbreviation for surficial sample

1 - number of activity

B. Ground Surface Elevation - Indicated elevations on the logs are estimated from topographic maps of the study area within an accuracy of half the contour interval.

C. Surficial Geologic Unit - Indicates the surficial geologic unit in which the activity is located.

D. Depth - Indicates depth interval for which soil description is given.

E. USCS - Unified Soil Classification Symbol; see Table 6-1 of Section 6.0, "Boring Logs", for details of USCS.

F. Soil Description - Soil is described based on field visual descriptions and/or laboratory test results. See Section 6.0, "Boring Logs", for procedures of soil description.

G. Sieve Analysis, LL and PI - These are from results of laboratory tests. See Section 6.0, "Boring Logs", for explanation.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
HV-CS-1	5480 (1684)	A4e	0.0-2.0 (0.0-0.8)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some silt; little fine gravel.	20	44	36		
HV-CS-5	5850 (1814)	A5i	0.0-0.75 (0.0-0.2)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some silt; trace fine gravel.					
			0.75-2.0 (0.2-0.8)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little fine to coarse sand; trace silt; occasional cobbles.					
HV-CS-10	5925 (1808)	A5y/A5i	0.0-2.0 (0.0-0.8)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to angular, calcareous; little silt; little fine gravel.					
HV-CS-13	5780 (1782)	A5i	0.0-2.0 (0.0-0.8)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, angular to subangular, calcareous; little silt; trace fine gravel; stage II caliche (0.75-1.5').					
HV-CS-16	8420 (1957)	A5i	0.0-0.75 (0.0-0.2)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; little silt; trace fine gravel.					
			0.75-1.75 (0.2-0.8)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular, calcareous; some fine to coarse sand; stage III caliche at 1.75'.					
HV-CS-19	6040 (1841)	A5i	0.0-2.0 (0.0-0.8)	SM	SILTY SAND, light brown to white, fine to coarse, poorly graded, angular, calcareous; little silt; trace fine gravel; stage III caliche (0.5'-2.0').					
HV-CS-20	5735 (1748)	A5y/A5i	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some silt; some fine gravel.	23	48	28		
			1.0-2.0 (0.3-0.8)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subrounded to subangular, calcareous; some fine to coarse sand; trace silt.					
HV-CS-21	5844 (1781)	A5y/A5i	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; some silt; trace fine gravel.					
			1.0-2.0 (0.3-0.8)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace silt.					

LOGS OF SURFICIAL SOIL SAMPLES  
VERIFICATION SITE,  
HAMLIN COP, NEVADA

NX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
8-1  
1 of 3

FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
HV-CS-23	8120 (1865)	A5e	0.0-2.0 (0.0-0.6)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace silt; stage II caliche (0.25'-2.0').					
HV-CS-24	8210 (1883)	A5e	0.0-2.0 (0.0-0.6)	GP-SM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace nonplastic silt; occasional cobbles.	50	38	11		NP
HV-CS-28	8120 (1865)	A5e	0.0-2.0 (0.0-0.6)	GM	SANDY GRAVEL, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; some silt.	42	35	23		
HV-CS-27	8100 (1858)	A5i	0.0-0.75 (0.0-0.2)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; little silt; trace fine gravel.					
			0.75-2.0 (0.2-0.6)	SP	GRAVELLY SAND, light brown, fine to coarse, poorly graded, calcareous; little fine to coarse gravel; trace silt; stage II caliche (0.75'-2.0').					
HV-CS-32	5775 (1780)	A4e/A1	0.0-2.0 (0.0-0.6)	SC	CLAYEY SAND, light brown, fine to coarse, poorly graded, calcareous; some slightly plastic clay; stage II caliche (1.0'-2.0').					
HV-CS-35	5780 (1782)	A4e/A1	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, calcareous; little silt.					
HV-CS-37	5830 (1777)	A5y	0.0-1.5 (0.0-0.5)	SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, calcareous; some fine to coarse gravel; little silt.					
			1.5-2.0 (0.5-0.6)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace silt; occasional cobbles.					
HV-CS-38	5980 (1823)	A5i/A5y	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; some silt; trace fine gravel.					
			1.0-2.0 (0.3-0.6)	GP	SANDY GRAVEL, brown, fine, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace silt.					

LOGS OF SURFICIAL SOIL SAMPLES  
VERIFICATION SITE,  
HAMLIN COP, NEVADA

NX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

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FUGRO NATIONAL, INC.

AFY-17

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
HV-CS-45	8240 (1902)	A5i	0.0-2.0 (0.0-0.6)	SC	CLAYEY SAND, brown to light brown, fine to medium, poorly graded, calcareous; little slightly plastic clay; trace fine gravel.					
HV-CS-47	8420 (1957)	A5i	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, brown, fine to medium, poorly graded, calcareous; some silt; trace fine gravel.					
			1.0-2.0 (0.3-0.6)	SP	SAND, light brown, fine to coarse, poorly graded, calcareous; trace fine gravel; trace silt.					
HV-CS-49	8050 (1844)	A5i/A4o	0.0-1.5 (0.0-0.5)	SC-SM	CLAYEY SAND, brown, fine to coarse, poorly graded, calcareous; some slightly plastic clay; trace fine gravel.	12	63	25	36	12
			1.5-2.0 (0.5-0.8)	GP	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; trace silt.					
HV-CS-51	8130 (1868)	A5i/A4o	0.0-2.0 (0.0-0.6)	SC-SM	CLAYEY SAND, brown to light brown, fine to coarse, poorly graded, calcareous; some slightly plastic clay; trace fine gravel.	4	68	28		
HV-CS-52	8160 (1878)	A5i/A4o	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, calcareous; some silt.					
HV-CS-55	8120 (1865)	A5i/A4o	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, calcareous; some silt; trace fine gravel; occasional cobbles.					
HV-CS-58	8060 (1847)	A5i/A4o	0.0-2.0 (0.0-0.6)	SC-SM	CLAYEY SAND, brown, fine to coarse; poorly graded, calcareous; some medium plastic clay; little fine gravel; stage II-III caliche (1.0'-2.0').	20	48	34	45	18
HV-CS-57	8010 (1832)	A5i/A4o	0.0-2.0 (0.0-0.6)	SC-SM	CLAYEY SAND, brown, fine to coarse, poorly graded, calcareous; some medium plastic clay; little fine gravel; stage II-III caliche (1.0'-2.0').					
HV-CS-61	8280 (1908)	A5y/A4o	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown to light brown, fine to coarse, poorly graded, calcareous; some silt; stage II caliche (1.5'-2.0').	4	67	29		

LOGS OF SURFICIAL SOIL SAMPLES  
VERIFICATION SITE,  
HAMLIN CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
8-1  
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FUGRO NATIONAL, INC.

**SECTION 9.0**  
**LABORATORY TEST RESULTS**

EXPLANATIONS OF LABORATORY TEST RESULTS

Laboratory test results are presented in this section. Table 9-1 contains a summary of laboratory test results. This table contains results of sieve analysis; plasticity data; in-situ dry unit weight, moisture content, degree of saturation, and void ratio for drive and Pitcher samples; results of compaction tests; and specific gravity of solids. Other tests such as triaxial compression, unconfined compression, direct shear, consolidation, chemical, and California Bearing Ratio (CBR) are indicated on the table. Tables 9-2 through 9-6 and Figures 9-1 through 9-3 present results of triaxial compression, unconfined compression, direct shear, consolidation, chemical, and CBR tests.

All tests were performed in general accordance with the American Society for Testing and Materials (ASTM) procedures. The following table presents the ASTM designations for the tests performed during the investigation.

<u>Type of Test</u>	<u>ASTM Designations</u>
Particle Size Analysis	D 422-63
Liquid Limit	D 423-66
Plastic Limit	D 424-59
Unit Weight	D 2937-71
Moisture Content	D 2216-71
Compaction	D 1557-70
Specific Gravity of Solids	D 854-58
Triaxial	D 2850-70
Unconfined Compression	D 2166-66
Direct Shear	D 3080-72
Consolidation	D 2435-70
Test for Alkalinity (pH)	D 1067-70
Water Soluble Sodium	D 1428-64
Water Soluble Chloride	D 512-67
Water Soluble Sulphate	D 516-68
Water Soluble Calcium	D 511-72
Calcium Carbonate	D 1126-67
California Bearing Ratio (CBR)	D 1883-73

Explanation for the tables and figures presented in this section are as follows.

A. Activity Number - Boring, trench, test pit, or surficial sample designation.

B. Sample Number - Prefix indicates the type of sample; explanation is at the bottom of the table.

C. Sample Interval - This is the depth range measured from ground surface over which the sample was obtained.

D. Percent Finer by Weight - Presents the results of laboratory particle size analysis (ASTM D 422-63) performed on representative soil samples at the depth indicated. The numbers represent the percent (by dry weight) of the total sample weight passing through each sieve size indicated.

E. Atterberg Limits (ASTM D 423-66 and D 424-59)

LL - Liquid Limit, the water content (as percent of soil dry weight) corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

F. USCS - Unified Soil Classification Symbols are given here; see Table 6.1 in Section 6.0, "Boring Logs", for complete details of USCS system.

G. In Situ - Presents results of tests on drive and Pitcher samples.

Dry Unit Weight - indicates dry unit weight of soil determined as per ASTM D 2937-71

Moisture Content - weight of water reported in percent of dry weight of soil sample (ASTM D 2216-71)

Saturation - the degree of saturation in a soil sample is defined as the ratio (in percent) of the volume of water to the volume of all voids in the soil

Void Ratio - the numerical ratio of the volume of voids to the volume of solids in a soil specimen

H. Compacted - Indicates results of laboratory maximum dry density and optimum moisture content test as per ASTM D 1557-70.

I. Specific Gravity of Solids (ASTM D 854-58) - Indicates the ratio of (1) the weight in air of a given volume of soil solids at a stated temperature, to (2) the weight in air of an equal volume of distilled water at a stated temperature.

J. Triaxial - The triaxial compression tests were performed in accordance with the procedures of ASTM D 2850-70. The following explanations and definitions apply.

Triaxial Compression Test - a cylindrical specimen of soil is surrounded by a fluid in a pressure chamber and subjected to an isotropic pressure. An additional compressive load is then applied, directed along the axis of the specimen called the axial load.

Consolidated-Drained (CD) Test - a triaxial compression test in which the soil was first consolidated under an all-around confining stress (test chamber pressure), and was then compressed (and hence sheared) by increasing the

vertical stress. Drained indicates that excess pore water pressure generated by strains are permitted to dissipate by the free movement of pore water during consolidation and compression.

Consolidated-Undrained (CU) Test - a triaxial compression test in which essentially complete consolidation under the confining (chamber) pressure is followed by a shear test at constant water content.

Confining Pressure ( $\sigma_3$ ) - the isotropic chamber pressure applied to the soil specimen during consolidation and compression.

Maximum Deviator Stress ( $\sigma_1 - \sigma_3$ ) - the difference between the major and minor principal stresses in the specimen at failure. The major principal stress on the specimen is equal to the unit axial load plus the chamber pressure and the minor principal stress on the specimen is equal to the chamber pressure.

Strain Rate - axial strain,  $\epsilon$ , at a given stress level is defined as the ratio of the change in length ( $\Delta L$ ) of the specimen to the original length of the specimen ( $L_0$ ). The rate of strain was controlled during the test so that this ratio increased at equal increments for each minute of testing.

Back Pressure - pressure in excess of atmospheric applied to the pore water of a soil sample. Back pressure is usually applied to (1) increase saturation of the sample, or (2) simulate the actual in-situ pressure regime.

- K. Unconfined Compression - Test procedures were as described in ASTM D 2166-66. Unconfined compressive strength is defined as the load per unit area at which an unconfined prismatic or cylindrical specimen of soil will fail in a simple compression test. In these methods, unconfined compressive strength is taken as the maximum load attained per unit area or the load per unit area at 20 percent axial strain, whichever occurred first during the performance of a test.

- L. Direct Shear - The procedures of ASTM D 3080-72 were followed for direct shear testing. In this test, soil under an applied normal load is stressed to failure by moving one section of the soil container (shear box) relative to the other section. Normal stress is the value of load per unit area acting perpendicular to the plane of shearing. Maximum shear strength is defined as the maximum resistance (ksf) of a soil to shearing (tangential) stresses.
- M. Consolidation (ASTM D 2435-70) - A consolidation test is a test in which a cylindrical soil specimen is laterally confined in a ring and compressed between porous plates. The term "consolidation", as used here, indicates the gradual reduction in volume of the soil mass resulting from an increase in compressive stress (axial load per unit area).
- N. Chemical - The chemical tests performed on soil samples included: pH; water soluble sodium, chloride, sulphate, calcium; and calcium carbonate content. pH is an index of the acidity or alkalinity of a soil in terms of the logarithm of the reciprocal of the hydrogen ion concentration. ASTM test procedure designations for these chemical tests are included in the table at the beginning of the "Explanation of Laboratory Test Results".
- O. CBR - California Bearing Ratio (CBR) is the ratio (in percent) of the resistance to penetration developed by a subgrade soil to that developed by a standard crushed-rock

base material. The procedures for conducting a CBR test were as outlined in ASTM D 1883-73. The materials tested for CBR were also analyzed for particle size distribution (ASTM D 422-63) and compaction characteristics (ASTM D 1557-70). The term "percentage of maximum density" indicates the ratio (as a percentage) of the compacted sample dry unit weight to maximum dry density obtained in the laboratory from ASTM D 1557-70, "Moisture-Density Relations of Soils Using 10-pound (4.5 kg) Hammer and 18-inch (457 mm) Drop".

APPENDIX B  
CONTINUE ON  
NEXT PAGE

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL	PERCENT FINER BY WEIGHT										
			STANDARD SIEVE OPENING							U.S. STANDARD			
			BLDRS.	COBBLES	GRAVEL					4	10	40	
		FEET	METERS	24"	12"	8"	3"	1½"	¾"	3/8"	4	10	40
	P-16	100.0-101.2	30.48-30.85										
	P-17	120.0-123.2	36.58-37.55								100	94	89
HV-B-6	D-1	0.5-1.0	0.15-0.30					100	87	64	52	46	40
	D-3	6.0-6.5	1.83-1.98					100	95	80	62	31	
	D-4	10.8-11.4	3.29-3.47										
	D-5	15.6-15.9	4.75-4.85					100	78	63	41	24	17
	D-6	20.2-20.5	6.16-6.25					100	97	73	55	38	21
	D-9	50.0-50.2	15.24-15.30					100	92	69	54	40	21
	D-12	79.0-79.7	24.08-24.29					100	96	85	78	69	62
	D-13	100.2-100.9	30.54-30.75					100	96	83	67	54	
	D-14	122.5-122.8	37.34-37.43					100	99	96	94	92	
HV-T-1	B-1	0.25-0.75	0.08-0.23							100	87	77	64
HV-T-2	B-1	0.25-1.5	0.08-0.46							100	76	65	54
HV-T-3	B-1	0.1-1.0	0.03-0.30							100	92	90	86
HV-T-4	B-1	0.1-1.0	0.03-0.30							100	97	93	86
	b-2	5.0-6.0	1.52-1.83									100	95
HV-T-5	B-1	0.1-1.0	0.03-0.30							100	92	85	77
	b-2	2.0-2.5	0.61-0.76										
HV-T-6	B-1	0.5-1.5	0.15-0.46							100	95	93	89
HV-T-7	B-1	0.5-1.5	0.15-0.46					100	99	97	92	86	81
HV-T-8	B-1	0.1-1.0	0.03-0.30							100	94	86	61
HV-T-9	B-1	0.5-2.0	0.15-0.61							100	91	77	60
HV-T-10	B-1	0.1-1.5	0.03-0.46							100	97	83	75
HV-T-11	B-1	0.1-2.0	0.03-0.61					100	98	93	70	44	29
HV-P-1	b-1	0.25-1.0	0.08-0.30										
HV-P-7	b-1	0.1-0.5	0.03-0.15							100	94	88	77
HV-P-9	b-1	0.25-1.0	0.08-0.30										

## NOTES:

(a) Sample types

SS - Standard split spoon

P - Pitcher

D - Fugro Drive

B,b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) \* Indicates that test has been performed  
and results are included in this report

<b>3/8"</b>	<b>4</b>	<b>10</b>	<b>40</b>	<b>100</b>	<b>200</b>	<b>.005</b>	<b>.001</b>	<b>LL</b>	<b>PL</b>	<b>PI</b>		<b>(psi)</b>	<b>(kg/m²)</b>	<b>=</b>	<b>≈</b>	<b>(psi)</b>	<b>(kg/m²)</b>
100	94	89	73	44	27						SM	115.7	1853	11.2	66.4	0.46	
											SM	107.2	1717	18.3	86.2	0.57	
64	52	46	40	22	16						GM	106.7	1709	4.3	20.2	0.58	
95	80	62	38	27	23						SM	126.1	2020	1.3	10.3	0.34	
											GW-GM	140.2	2246	5.8	77.3	0.20	
63	41	24	11	7	6						GW-GM	140.0	2243	8.0	100.0	0.20	
73	55	38	21	12	9						SW-SM	140.7	2254	7.2	98.6	0.20	
69	54	40	27	18	14						GM			13.2			
85	78	69	62	44	38	13	8	48	32	16	SM	108.3	1735	14.8	71.9	0.56	
96	83	67	54	37	26						SM	123.0	1970	11.7	85.2	0.37	
99	96	94	92	85	72						ML	102.2	1637	17.5	72.7	0.65	
100	87	77	64	41	27						NP	SM					
76	65	54	41	31	23							SM					
92	90	86	64	39	29			30	21	9	SC						
97	93	86	62	40	28						SM						
	100	95	88	81	19	7					ML						
92	85	77	56	35	27						SM						
											SM						
95	93	89	58	27	19						NP	SM			128.0	2051	
92	86	81	67	32	22						NP	SM			127.2	2038	
100	94	86	60	31	21						SM						
77	60	44	28	17	14						SM				133.7	2142	
83	75	70	60	39	29						NP	SM			129.5	2074	
70	44	29	19	13	10						GP-GM				141.9	2273	
•											SM						

SITES (b)		USCS (c)	IN-SITU				COMPACTED				SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
L	PI		DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)							
(pcf)	(kg/m³)		(pcf)	(kg/m³)	(%)	(%)	(pcf)	(kg/m³)	(%)							
		SM	115.7	1853	11.2	66.4	0.46									
		SM	107.2	1717	18.3	86.2	0.57									
		GM	106.7	1709	4.3	20.2	0.58									
		SM	126.1	2020	1.3	10.3	0.34									
		GW-GM	140.2	2246	5.8	77.3	0.20									
		GW-GM	140.0	2243	8.0	100.0	0.20									
		SW-SM	140.7	2254	7.2	98.6	0.20									
		GM			13.2											
32	16	SM	108.3	1735	14.8	71.9	0.56									
		SM	123.0	1970	11.7	85.2	0.37									
		ML	102.2	1637	17.5	72.7	0.65									
		NP	SM													
			SM													
21	9	SC														
			SM													
			ML													
			SM													
			SM													
		NP	SM				128.0	2051	10.0							*
		NP	SM				127.2	2038	10.9							*
			SM													
			SM				133.7	2142	7.9							*
		NP	SM				129.5	2074	9.0							*
			GP-GM				141.9	2273	6.0							*
			SM													*
			SM													
18	5	CL-ML														

**SUMMARY OF LABORATORY TEST RESULTS  
VERIFICATION SITE, HAMLIN VALLEY CDP, NEVADA**

NR SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - SAMSO	TABLE B-1
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**FEDERAL NATIONAL INC.**

AFV-01

2

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL	PERCENT FINER BY WEIGHT								
			STANDARD SIEVE OPENING						U.S. ST.		
			BLDRS.	COBBLES	GRAVEL						
		FEET	METERS	24"	12"	6"	3"	1½"	¾"	3/8"	4
HV-B-1	D-1	0.0-0.7	0.00-0.21						100	89	74
	D-2	3.1-3.8	0.94-1.16						100	96	75
	D-3	6.1-6.8	1.86-2.07					100	90	80	66
	D-4	10.5-10.8	3.20-3.29								50
	D-5	15.2-15.4	4.63-4.69								
	D-6	20.0-20.2	6.10-6.16					100	91	70	49
	D-7	25.2-25.7	7.68-7.83						100	71	50
	D-8	30.0-30.2	9.14-9.20								34
	D-9	40.7-40.9	12.41-12.47								
	D-10	50.0-50.7	15.24-15.45					100	80	67	50
	D-11	60.0-60.5	18.29-18.44								39
	D-12	74.0-74.8	22.56-22.80						100	98	84
	D-13	90.0-90.4	27.43-27.55					100	84	76	44
	D-15	120.0-120.3	36.58-36.67								32
	D-16	144.0-144.5	43.89-44.04								
	D-17	161.0-161.2	49.07-49.13					100	71	71	51
											47
HV-B-2	D-1	0.5-1.2	0.15-0.37					100	82	75	69
	D-3	6.2-6.9	1.89-2.10						100	94	81
	D-4	9.7-10.4	2.96-3.17						100	87	75
	D-5	15.2-15.9	4.63-4.85						100	89	72
	D-6	20.0-20.2	6.10-6.16						100	89	81
	D-7	25.1-25.7	7.65-7.83					100	91	67	49
	D-8	30.0-30.6	9.14-9.33								34
	D-9	40.0-40.2	12.19-12.25								
	D-10	55.0-55.3	16.76-16.86						100	84	64
	D-11	70.0-70.4	21.34-21.46								51
	D-12	90.2-90.7	27.49-27.65								
	D-15	135.9-136.4	41.42-41.57								
	D-16	160.1-160.6	48.80-48.95						100	92	68
											51
HV-B-3	D-1	0.7-1.4	0.21-0.43					100	69	66	52
	D-2	3.2-3.9	0.98-1.19							100	99
	D-3	7.9-8.5	2.41-2.59								
	D-4	10.7-11.4	3.26-3.47					100	78	60	46
	D-5	16.2-16.9	4.94-5.15						100	86	76
	D-6	21.2-21.9	6.46-6.68								
	D-7	26.2-26.9	7.99-8.20						100	94	91
	D-8	31.2-31.9	9.51-9.72						100	98	93
	D-9	40.2-40.9	12.25-12.46								
	D-10	50.0-50.4	15.24-15.36					100	94	88	87
	D-11	59.4-59.9	18.11-18.26								
	D-12	69.4-69.9	21.15-21.31								

## NOTES:

(a) Sample types

SS - Standard split spoon

P - Pitcher

D - Fugro Drive

B.b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) \* Indicates that test has been performed

and results are included in this report

PERCENT FINER BY WEIGHT										ATTERBERG LIMITS (b)	USCS (c)	IN-SITU						MAXIM DRY DENS (pcf)		
SIEVE OPENING			U S STANDARD SIEVE NO				PARTICLE SIZE (mm)					DRY UNIT WEIGHT			MOISTURE CONTENT (%)	SATURAT ION (%)	WATER RATIO	MAXIM DRY DENS (pcf)		
GRAVEL			SAND			SILT OR CLAY						LL	PL	PI	(pcf)	(kg/m <sup>3</sup> )				
3"	1 1/2"	3/4"	3/8"	4	10	40	100	200	.005	.001										
				100	89	74	60	47	37	29		SM	91.5	1466	6.2	19.9	0.84			
				100	96	75	56	36	24	15	10	SP-SM	132.9	2129	1.2	12.4	0.27			
				100	90	90	80	66	50	35	28	SM	124.7	1998	2.7	20.8	0.35			
												GP-GM	143.5	2299	8.5	100.0	0.17			
												GP-GM	131.7	2110	6.3	60.8	0.28			
												GP-GM	136.8	2191	8.6	99.7	0.23			
												GW-GM	134.6	2156	6.4	68.7	0.29			
												GW-GM	132.8	2127	9.8	98.3	0.27			
												GP-GM	123.9	1985	8.6	65.0	0.36			
												GP-GM	136.3	2183	8.2	93.5	0.24			
												GP-GM	133.2	2134	8.8	89.9	0.27			
												SM	133.3	2135	8.9	90.8	0.26			
												GP-GM	134.2	2150	7.9	83.1	0.26			
												GM	133.1	2132	8.9	90.0	0.27			
												GM	132.4	2121	9.2	90.8	0.27			
												GM	130.4	2089	9.1	84.2	0.29			
												SM	85.6	1371	6.9	19.4	0.97			
												SM	112.7	1805	3.9	21.3	0.5			
												SM	117.9	1889	3.1	19.5	0.43			
												SM	115.0	1842	6.3	36.4	0.47			
												GP-GM	119.1	1908	10.3	67.3	0.42			
												SM	117.2	1877	12.3	75.9	0.44			
												SM	120.3	1927	12.4	83.9	0.40			
												SM	117.8	1887	10.3	64.9	0.43			
												SM	123.1	1972	10.6	77.9	0.37			
												SM	133.1	2132	8.8	89.2	0.27			
												SM	119.8	1919	16.6	100.0	0.41			
												SM	123.8	1983	11.6	86.7	0.36			
												GM	101.4	1624	3.7	15.3	0.66			
												SM	102.0	1634	7.7	36.4	0.57			
												SP-SM								
												SP-SM	122.1	1956	9.6	68.5	0.38			
												SM	112.3	1799	9.4	50.6	0.50			
												SM	130.9	2097	4.7	44.2	0.29			
												SM	111.9	1792	9.9	52.7	0.51			
												SM	114.9	1841	11.4	66.0	0.47			
												SP-SM	128.8	2063	5.5	47.9	0.31			
												SP-SM	101.6	1627	20.9	85.5	0.60			
												SP-SM	103.3	1655	22.5	90.5	0.63			
												CL-ML	112.6	1804	14.3	78.0	0.50			

Classification System

has been performed  
uded in this report

2

TERBERG BITS (b)		USCS (c)	IN-SITU				COMPACTED				SPECIFIC GRAVITY OF SOLIDS	UNCONFINED COMPRESSION	TRIAXIAL (d)	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR						
PL	PI		DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)													
			(pcf)	(kg/m³)				(pcf)	(kg/m³)														
	SM	91.5	1466	6.2	19.9	0.84																	
	SP-SM	132.9	2129	1.2	12.4	0.27																	
	SM	124.7	1998	2.7	20.8	0.35																	
	GP-GM	143.5	2299	8.5	100.0	0.17																	
	GP-GM	131.7	2110	6.3	60.8	0.28																	
	GP-GM	136.8	2191	8.6	99.7	0.23																	
	GW-GM	134.6	2156	6.4	68.7	0.25																	
	GW-GM	132.8	2127	9.8	98.3	0.27																	
	GP-GM	123.9	1985	8.6	65.0	0.36																	
	GP-GM	136.3	2183	8.2	93.5	0.24																	
	GP-GM	133.2	2134	8.8	89.9	0.27																	
	SM	133.3	2135	8.9	90.8	0.26																	
	GP-GM	134.2	2150	7.9	83.1	0.26																	
	GM	133.1	2132	8.9	90.0	0.27																	
	GM	132.4	2121	9.2	90.8	0.27																	
	GM	130.4	2089	9.1	84.2	0.29																	
	SM	85.6	1371	6.9	19.4	0.97																	
	SM	112.7	1805	3.9	21.3	0.5																	
	SM	117.9	1889	3.1	19.5	0.43																	
	SM	115.0	1842	6.3	36.4	0.47																	
	SM																						
	GP-GM	119.1	1908	10.3	67.3	0.42																	
	SM	117.2	1877	12.3	75.9	0.44																	
	SM	120.3	1927	12.4	83.9	0.40																	
	SM	117.8	1887	10.3	64.9	0.43																	
	SM	123.1	1972	10.6	77.9	0.37																	
	SM	133.1	2132	8.8	89.2	0.27																	
	SM	119.8	1919	16.6	100.0	0.41																	
	SM	123.8	1983	11.6	86.7	0.36																	
	CM	101.4	1624	3.7	15.3	0.61																	
	SM	102.0	1634	7.7	36.4	0.57										*							
	SP-SM																						
	SP-SM	122.1	1956	9.6	68.5	0.38																	
	SM	112.3	1799	9.4	50.6	0.50																	
	SM	130.9	2097	4.7	44.2	0.29																	
	SM	111.9	1792	9.9	52.7	0.51																	
	SM	114.9	1841	11.4	66.0	0.47									*								
	SP-SM	128.8	2063	5.5	47.9	0.31																	
	SP-SM	101.6	1627	20.9	85.5	0.60																	
	SP-SM	103.3	1655	22.5	96.5	0.63																	
	CL-MI	112.6	1804	14.3	78.0	0.50									*								

SUMMARY OF LABORATORY TEST RESULTS  
VERIFICATION SITE, N. LIN VALLEY CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE  
9-1  
TOP 4

FUGRO NATIONAL, INC.

AFV-01

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT								
				STANDARD SIEVE OPENING						U S STAN		
		FEET	METERS	24"	12"	6"	3"	1½"	¾"	⅓"	4	10
HV-B-3	P-13	85.0-85.6	25.91-26.09								100	99
	P-13	85.6-86.2	26.09-26.27									
	P-13	86.2-86.9	26.27-26.49									
	P-14	98.5-101.2	30.02-30.85									
	P-15	120.1-122.2	36.61-37.25								100	98
	P-16	141.1-143.0	43.01-43.59								100	
	P-17	160.5-163.3	48.92-49.77									
HV-B-4	D-1	0.7-1.4	0.21-0.43								100	59
	D-2	3.2-3.9	0.98-1.19								100	46
	D-3	6.2-6.9	1.89-2.10								100	42
	D-4	10.7-11.4	3.26-3.47								100	71
	D-5	15.2-15.9	4.63-4.85									
	D-6	20.2-20.9	6.16-6.37									
	D-7	25.2-25.9	7.68-7.89								100	33
	D-8	30.2-30.9	9.20-9.42								100	29
	D-9	40.4-40.9	12.31-12.47									
	D-10	50.4-50.9	15.36-15.51								100	45
	D-11	60.0-60.3	18.29-18.38									
	D-12	75.4-75.9	22.08-23.13									
	D-13	90.0-90.3	27.74-27.52								100	47
	D-14	100.0-100.2	30.48-30.54									
	D-15	120.4-120.9	36.70-36.85								100	44
	D-16	141.1-142.0	43.01-43.28								100	49
	D-17	160.5-163.2	48.92-49.74									
HV-B-5	D-1	0.2-0.9	0.06-0.27								100	75
	D-2	3.5-4.2	1.07-1.28								100	92
	D-3	7.0-7.7	2.13-2.35									
	D-4	10.0-10.7	3.05-3.26								100	94
	D-4	10.7-11.4	3.26-3.47									
	D-4	11.4-12.1	3.47-3.68									
	D-5	15.0-15.3	4.57-4.66									
	D-5	15.3-15.9	4.66-4.85									
	D-5	15.9-16.8	4.85-5.12									
	D-7	20.3-21.0	6.19-6.40									
	D-8	24.5-26.7	7.47-8.14								100	85
	D-10	40.4-40.9	12.31-12.47									
	D-11	49.5-51.8	15.09-15.79								100	70
	D-12	60.9-61.4	18.56-18.71								100	80
	D-13	70.2-70.7	21.40-21.55									
	D-14	77.1-79.4	23.50-24.20									
	D-15	89.2-90.2	27.19-27.49								100	84

## NOTES:

(a) Sample types

SS - Standard split spoon

P - Pitcher

D - Fugro Drive

B.b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) \* Indicates that test has been performed

and results are included in this report

PERCENT FINER BY WEIGHT											ATTERBERG LIMITS (b)	USCS (c)	IN-SITU					
STANDARD SIEVE OPENING				U.S. STANDARD SIEVE NO.					PARTICLE SIZE (mm)		ATTERBERG LIMITS (b)	USCS (c)	DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)		
ES	GRAVEL			SAND			SILT OR CLAY		LL	PL	PI		(pcf)	(kg/m³)				
6"	3"	1 1/2"	3/4"	3/8"	4	10	40	100	200	.005	.001							
					100	99	96	75	58			CL-ML	96.1	1539	22.3	79.9	0.75	
												CL-ML	91.5	1466	28.2	90.5	0.84	
												CI-ML	95.6	1531	26.3	93.1	0.76	
												CL-ML	101.2	1621	20.9	84.7	0.67	
					100	98	90	67	49			SC-SM	86.4	1384	35.0	99.6	0.95	
						100	97	90	83			CL-ML	98.0	1570	24.9	93.5	0.72	
												CL-ML	106.9	1712	19.7	92.6	0.58	
												GM	103.1	1652	6.6	28.2	0.63	
					100	88	72	59	51	41	31	SM	116.5	1866	4.3	25.8	0.45	
						100	86	65	46	33	26	21	SM	119.3	1911	3.4	22.0	0.41
						100	87	61	42	31	25	21	SM	107.1	1716	6.5	30.6	0.57
						100	99	84	71	59	46	34	SM	111.2	1781	7.8	40.9	0.52
												GP-GM	125.1	2004	9.8	76.5	0.35	
						100	93	78	47	33	22	16	GP-GM	126.4	2025	7.8	63.5	0.33
						100	70	48	37	29	22	17	GP-GM	124.8	1999	9.5	72.9	0.35
						100	85	68	54	45	38	31	GP-GM	131.9	2113	9.0	87.3	0.28
												GM	120.6	1932	7.6	51.8	0.40	
												GM	125.6	2012	10.2	81.0	0.34	
												GM	127.4	2041	8.0	66.6	0.32	
						100	93	78	62	47	35	28	SM		9.9			
												SM	123.8	1983	13.4	99.9	0.36	
						100	83	60	51	44	39	30	GC	125.4	2009	9.6	75.2	0.34
						100	96	68	49	36	28	23	SM		10.3			
												SM	133.7	2142	11.3	100.0	0.26	
												SM						
						100	91	85	81	75	59	42	SM	88.1	1411	21.0	62.1	0.91
						100	96	94	92	80	63	50	SM-MI	98.2	1573	10.6	40.1	0.72
												SM	103.4	1656	5.7	24.6	0.63	
						100	98	94	81	67	57	34	CL	101.0	1618	16.7	67.5	0.67
												CL	81.6	1307	23.2	58.8	1.06	
												CL	85.6	1371	26.2	73.1	0.97	
												ML	79.2	1269	36.4	87.2	1.13	
												SM	95.0	1523	21.7	75.8	0.77	
												SM	99.1	1587	14.5	55.9	0.70	
												SM	90.2	1445	12.8	39.8	0.87	
						100	99	92	85	78	63	41	SM	88.5	1418	18.6	55.7	0.90
												GC	123.8	1983	9.3	69.5	0.36	
						100	97	85	70	38	23	18	SC	118.4	1897	12.6	80.3	0.42
						100	92	88	80	56	43	34	SM	96.8	1551	15.8	57.6	0.74
												SM	129.1	2068	11.8	104.3	0.31	
						100	98	92	84	34	15	11	SM	108.9	1744	10.4	51.3	0.55
												SM	106.6	1708	9.6	44.9	0.58	

Soil Classification System

A test has been performed  
and included in this report

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ERG (b)	USCS (c)	IN-SITU				COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR						
		DRY UNIT WEIGHT		MOISTURE CONTENT (g)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY														
		(pcf)	(kg/m³)				(pcf)	(kg/m³)													
	CL-ML	90.1	1539	22.3	79.9	0.75				*											
	CL-ML	91.5	1466	28.2	90.5	0.84				*											
	CL-ML	95.6	1531	26.3	93.1	0.76				*											
	CL-ML	101.2	1621	20.9	84.7	0.67															
8	SC-SM	86.4	1384	35.0	99.6	0.95									*						
	CL-MJ	98.0	1570	24.9	93.5	0.72															
	CL-ML	106.9	1712	19.7	92.6	0.58									*						
	GM	103.1	1652	6.6	28.2	0.63															
	SM	116.5	1866	4.3	25.8	0.45															
	SM	119.3	1911	3.4	22.0	0.41															
	SM	107.1	1716	6.5	30.6	0.57															
	SM	111.2	1781	7.8	40.9	0.52															
	GP-GM	125.1	2004	9.8	76.5	0.35															
	GP-GM	126.4	2025	7.8	63.5	0.33															
	GP-GM	124.8	1999	9.5	72.9	0.35															
	GP-GM	131.9	2113	9.0	87.3	0.28															
	GM	120.6	1932	7.6	51.8	0.40															
	GM	125.6	2012	10.2	81.0	0.34															
	GM	127.4	2041	8.0	66.6	0.32															
	SM			9.9																	
	SM	123.8	1983	13.4	99.9	0.36															
2	18	GC	125.4	2009	9.6	75.2	0.34														
	SM			10.3																	
	SM	133.7	2142	11.3	100.0	0.26															
	SM																				
	SM	88.1	1411	21.0	62.1	0.91															
	SM-MI	98.2	1573	10.6	40.1	0.72															
	SM	103.4	1656	5.7	24.6	0.63															
3	19	CL	101.0	1618	16.7	67.5	0.67				*										
	CL	81.6	1307	23.2	58.8	1.06				*											
	CL	85.6	1371	26.2	73.1	0.97				*											
5	9	ML	79.2	1269	36.4	87.2	1.13							*							
	SM	95.0	1523	21.7	75.8	0.77				*											
	SM	99.1	1587	14.5	55.9	0.70															
	SM	90.2	1445	12.8	39.8	0.87															
	SM	88.5	1418	18.6	55.7	0.90							*								
	GC	123.8	1983	9.3	69.5	0.36									*						
3	13	SC	118.4	1897	12.6	80.3	0.42														
8	19	SM	96.8	1551	15.8	57.6	0.74														
	SM	129.1	2068	11.8	104.3	0.31															
	SM	108.9	1744	10.4	51.3	0.55															
	SM	106.6	1708	9.6	44.9	0.58															

**SUMMARY OF LABORATORY TEST RESULTS**  
**VERIFICATION SITE, HAMLIN VALLEY COP, NEVADA**

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE SAMSO

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**FUGRO NATIONAL, INC.**

AFV-01

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT									
				STANDARD SIEVE OPENING						U.S. STANDARD			
		FEET	METERS	24"	12"	6"	3"	1½"	3 4"	3 8"	4	10	40
	P-16	100.0-101.2	30.48-30.85										
	P-17	120.0-123.2	36.58-37.55								100	94	89
HV-B-1	D-1	0.5-1.0	0.15-0.30								19	87	64
	D-3	6.0-6.5	1.83-1.98								100	95	80
	D-4	10.8-11.4	3.29-3.47								100	76	63
	D-5	15.0-15.9	4.75-4.85								100	97	73
	D-6	20.2-20.5	6.16-6.25								100	95	55
	D-9	50.0-50.2	15.24-15.30								100	92	69
	D-12	79.0-79.7	24.06-24.29								100	96	85
	D-13	100.2-100.9	30.54-30.75								100	96	83
	D-14	122.5-122.8	37.34-37.43								100	99	94
HV-T-1	B-1	0.25-0.75	0.08-0.23								100	87	77
HV-T-2	B-1	0.25-1.5	0.08-0.46								100	76	65
HV-T-3	B-1	0.1-1.0	0.03-0.30								100	92	90
HV-T-4	B-1	0.1-1.0	0.03-0.30								100	97	93
	b-2	5.0-6.0	1.52-1.83										100
HV-T-5	B-1	0.1-1.0	0.03-0.30								100	92	85
	b-2	2.0-2.5	0.61-0.76										
HV-T-6	B-1	0.5-1.5	0.15-0.46								100	95	93
HV-T-7	B-1	0.5-1.5	0.15-0.46								100	99	92
HV-T-8	B-1	0.1-1.0	0.03-0.30								100	94	86
HV-T-9	B-1	0.5-2.0	0.15-0.61								100	91	77
HV-T-10	B-1	0.1-1.5	0.03-0.46								100	97	83
HV-T-11	B-1	0.1-2.0	0.03-0.61								100	98	93
HV-P-1	b-1	0.25-1.0	0.08-0.30										
HV-P-7	b-1	0.1-0.5	0.03-0.15								100	94	88
HV-P-9	b-1	0.25-1.0	0.08-0.30										

## NOTES:

(a) Sample types

SS - Standard split spoon

P - Pitcher

D - Fugro Drive

B,b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) \* Indicates that test has been performed

and results are included in this report

FINER BY WEIGHT								ATTERBERG LIMITS (b)			USCS (c)	IN-SITU				COMPACTED			
U S STANDARD SIEVE NO				PARTICLE SIZE (mm)		DRY UNIT WEIGHT						MOISTURE CONTENT (%)		SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY (c)	
/8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)	(%)	(%)	(pcf)	(kg/m³)		
00	4	10	73	44	27						SM	115.7	1853	11.2	66.4	0.41			
00	4	10	73	44	27						SM	107.2	1717	18.3	86.2	0.57			
64	52	46	40	22	16						GM	106.7	1709	4.3	20.2	0.58			
25	80	62	38	27	23						SM	126.1	2020	1.3	10.3	0.34			
63	41	24	11	7	6						GW-GM	140.2	2246	5.8	77.3	0.20			
73	55	38	21	12	9						GW-GM	140.0	2243	8.0	100.0	0.20			
69	54	46	27	18	14						SW-SM	140.7	2254	7.2	98.6	0.20			
85	78	69	62	44	38	13	8	40	32	16	GM			13.2					
96	83	67	54	37	26						SM	108.3	1735	14.8	71.9	0.56			
99	96	94	92	85	72						SM	123.0	1970	11.7	85.2	0.37			
100	87	77	64	41	27						ML	102.2	1637	17.5	72.7	0.61			
76	65	54	41	31	23						NP	SM							
92	90	86	64	39	29			30	21	9	SC								
97	93	86	62	40	28						SM								
	100	95	88	81	19	7					ML								
92	85	77	56	35	27						SM								
											SM								
95	93	83	58	27	19						NP	SM				128.0	2051	10.0	
92	86	81	67	32	22						NP	SM				127.2	2038	10.9	
100	94	86	60	31	21						SM								
77	60	44	28	17	14						SM					133.7	2142	7.9	
83	75	70	60	39	29						NP	SM				129.5	2074	9.0	
70	44	29	19	13	10						GP-GM					141.0	2273	6.0	
											SM								
88	77	69	50	30	22						SM								
						65		23	18	5	CL-ML								

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ATTERBERG LIMITS (d)			USCS (c)	IN-SITU						COMPACTED						TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR							
IL	PL	PI		DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS																
				(pcf)	(kg/m³)				(kg/m³)	(pcf)																		
18	32	10		SM	115.7	1853	11.2	66.4	0.41																			
				SM	107.2	1717	18.3	86.2	0.57																			
				GM	106.7	1709	4.3	20.2	0.58																			
				SM	126.1	2020	1.3	10.3	0.34																			
				GW-GM	140.2	2246	5.8	77.3	0.20																			
				GW-GM	140.0	2243	8.0	100.0	0.20																			
				SW-SM	140.7	2254	7.2	38.6	0.20																			
				GM			13.2																					
				SM	108.3	1735	14.8	71.9	0.50																			
				SM	123.0	1970	11.7	85.2	0.37																			
30	21	9		ML	102.2	1637	17.5	72.7	0.67																			
				NP	SM																							
				SM																								
				SC																								
				SM																								
				ML																								
				SM																								
				SM																								
				NP	SM					128.0	2051	10.0									*							
				NP	SM					127.2	2038	10.9									*							
23	18	5	CL-MI.	SM																								
				SM						133.7	2142	7.9									*							
				NP	SM					129.5	2074	9.0									*							
				GP-GM						141.9	2273	6.0									*							
				SM																	*							
				SM																								
				SM																								
				SM																								
				SM																								
				SM																								

SUMMARY OF LABORATORY TEST RESULTS  
VERIFICATION SITE, HAMLIN VALLEY COP, NEVADA

MR SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE SAMSO

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FUGRO NATIONAL INC.

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B-1	1.0-2.0	0.30-0.61
b-1	0.5-1.0	0.15-0.30
b-1	0.25-0.75	0.08-0.23
b-1	0.25-1.0	0.08-0.30
B-1	0.25-1.0	0.08-0.30
B-1	0.5-1.0	0.15-0.30
b-1	0.5-1.0	0.15-0.30
b-1	0.25-0.75	0.08-0.23
b-1	0.25-1.0	0.08-0.30
b-1	0.25-0.5	0.08-0.15
b-1	0.5-1.5	0.15-0.46
b-1	0.25-1.0	0.08-0.30
b-1	0.25-1.0	0.08-0.30
B-1	0.25-1.0	0.08-0.30
b-1	0.25-0.75	0.08-0.23
B-1	0.25-1.0	0.08-0.30
B-1	0.5-1.25	0.15-0.38
B-1	0.25-1.0	0.08-0.30

SOIL FINEST BY WEIGHT								ATTERBERG LIMITS (b)			USCS (c)	IN-SITU				COMPACTED	
	U.S. STANDARD SIEVE NO.				PARTICLE SIZE (mm)							DRY UNIT WEIGHT	MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE (%)
	SAND			SILT OR CLAY		LL	PL	PI	(pcf)	(kg/m³)	(%)	(%)	(%)	(%)	(kg/m³)	(%)	
3/8"	4	10	40	100	200	.005	.001										
98	94	89	61	34	24						SC						
											SM						
		100	99	99	97	20	2	37	29	8	ML						
92	92	89	60	32	23						SM						
89	87	81	49	26	19						SM						
86	78	71	46	21	14						SM						
100	98	95	83	66	56			31	21	10	CL						
		100	93	77	62	5	5				ML						
											SM						
84	80	76	59	30	21						SM						
96	89	83	64	33	23						SM						
92	80	67	57	43	36						SM						
											SM						
87	76	68	57	37	28						SC						
71	50	36	24	14	11				NP	GP-GM							
72	58	44	36	27	23						GM						
											SM						
88	80	70	50	33	25			36	24	12	SC-SM						
100	96	86	62	38	28						SC-SM					*	
100	99	95	70	45	34			45	27	18	SC-SM					*	
											SC-SM						
93	88	80	49	34	29						SM						

stem  
med  
sport

2

B ERG (b)	USCS (c)	IN-SITU				COMPACTED				TRIAL (4)	SPECIFIC GRAVITY OF SOLIDS	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR							
		DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)														
		(pcf)	(kg/m³)				(pcf)	(kg/m³)															
	SC																						
	SM																*						
19 8	ML																						
	SM																						
	SM																						
	SM																						
21 10	CL																						
	ML																						
	SM																*						
	SM																						
	SM																						
	SM																*						
	SM																*						
	SC																						
NP	GP-GM																						
	GM																						
	SM																*						
24 12	SC-SM																						
	SC-SM							*									*						
27 18	SC-SM							*									*						
	SC-SM																*						
	SM																						

SUMMARY OF LABORATORY TEST RESULTS  
VERIFICATION SITE, HAMLIN VALLEY COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

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FUJIO NATIONAL, INC.

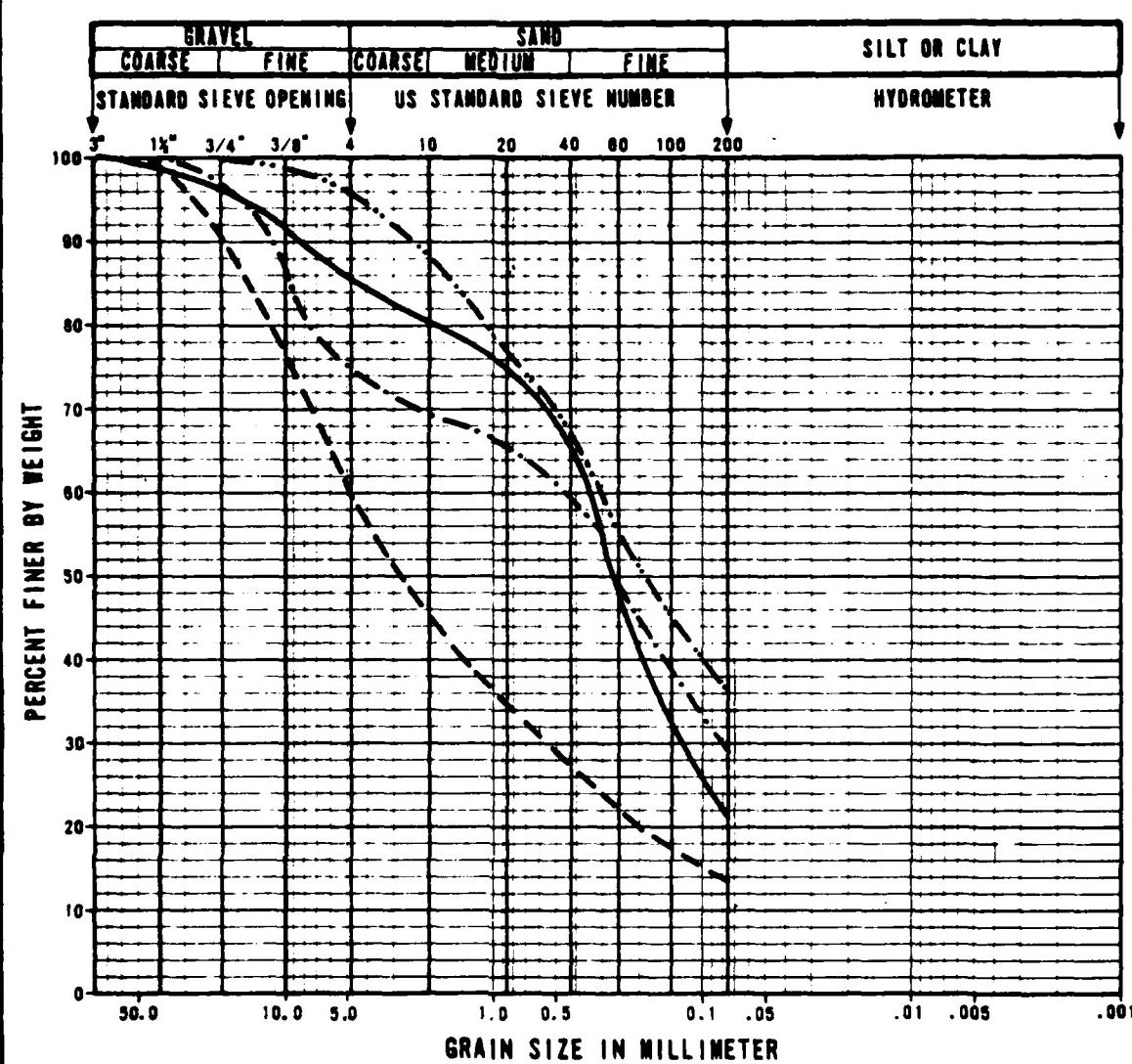
AFV-01

CHECKED BY \_\_\_\_\_ APPROVED BY \_\_\_\_\_

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	DRY DENSITY TEST	MOISTURE CONTENT (%)	CONFINING PRESSURE ( $\sigma_3$ ) kN/m <sup>2</sup>	MAXIMUM DEFORMATION STRESS ( $\sigma_1 - \sigma_3$ ) kN/m <sup>2</sup>	STRAIN RATE (%/min)	BACK PRESSURE kN/m <sup>2</sup>					
		FEET	METERS												
HV-B-3	P-13	85.0-85.6	25.91-26.09	CL-ML	CD	96.1	15538	22.3	0.6	412	17.7	.847	.004	0	0
		85.6-86.2	26.09-26.27	CL-ML	CD	91.5	1466	28.2	14.4	689	20.9	1001	.004	0	0
		86.2-86.8	26.27-26.49	CL-ML	CD	95.6	1531	26.3	20.2	967	28.6	1369	.004	0	0
HV-B-5	P-4	10.0-10.7	3.01-3.26	CL	CD	101.0	1618	16.7	1.0	48	4.6	220	.004	0	0
		10.7-11.4	3.26-3.47	CL	CD	81.6	1307	23.2	2.0	96	10.3	493	.004	0	0
		11.4-12.1	3.47-3.69	CL	CD	85.6	1371	26.2	3.0	144	11.8	565	.004	0	0

SUMMARY OF TRIAXIAL COMPRESSION TEST RESULTS  
VERIFICATION SITE, HAMLIN VALLEY COP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOTABLE  
9-2**FUGRO NATIONAL, INC.**

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SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
—	A	HV-T-7	0.5-1.5	0.15-0.46	SM
---	B	HV-T-9	0.5-2.0	0.15-0.60	SM
- -	C	HV-T-10	0.1-1.5	0.03-0.46	SM
---	D	HV-CS-51	0.5-1.2	0.15-0.38	SC-SM
		HV-CS-56	0.25-1.0	0.07-0.30	

GRAIN SIZE CURVES, CBR TESTS  
VERIFICATION SITE, HAMLIN VALLEY COP., NEVADA

NON SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
9-2

2 JUL 79

**FUSCO NATIONAL, INC.**

CHICAGO 01 PROPOSED BY

SUMMARY OF UNCONFINED COMPRESSION  
TEST RESULTS  
VERIFICATION SITE, HAMLIN VALLEY COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE  
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**MERONATIONAL, INC.**

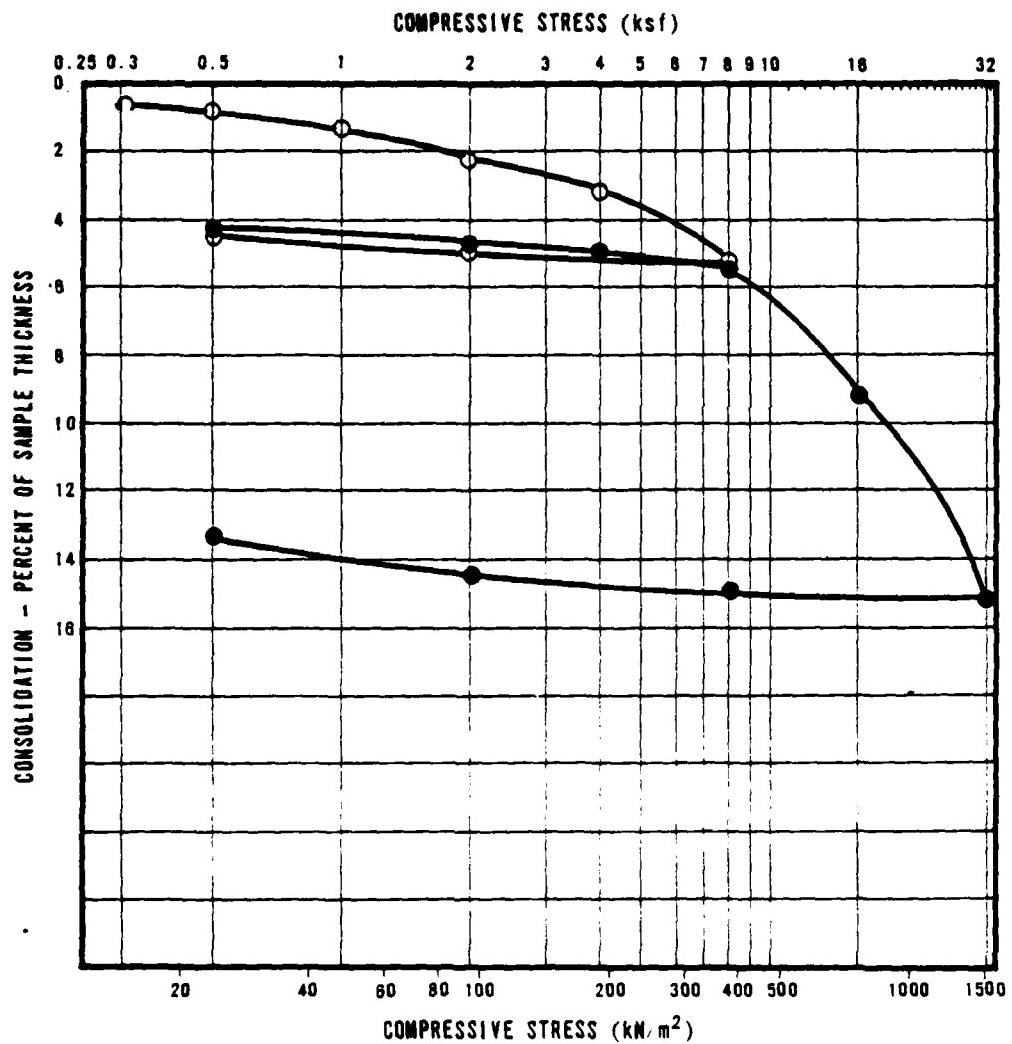
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SUMMARY OF DIRECT SHEAR TEST RESULTS  
VERIFICATION SITE, HAMLIN VALLEY COP., NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE  
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**FUGRO NATIONAL, INC.**



CHECKED BY \_\_\_\_\_ APPROVED BY \_\_\_\_\_

SYMBOL	BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	INITIAL DRY DENSITY		INITIAL MOISTURE CONTENT (%)	INITIAL VOID RATIO	INITIAL DEGREE OF SATURATION (%)
			FEET	METERS		pcf	$\text{kg}/\text{m}^3$			
○	HV-B-5	P-5	15.0-15.3	4.57-4.66	ML	79.2	1269	36.4	1.13	87.2

- AT FIELD MOISTURE
- AFTER ADDITION OF WATER
- COMPRESSION
- - - REBOUND

CONSOLIDATION TEST RESULTS  
VERIFICATION SITE, HAMLIN VALLEY CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE  
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APPLIED POLYMER SYMPOSIA

ACTIVITY NO.	SAMPLE INTERVAL		SOIL TYPE	pH	WATER SOLUBLE		CALCIUM CARBONATE mg/kg			
	FEET	METERS			SODIUM mg/kg	CHLORIDE mg/kg				
HV-B-3	0-3	7.9-8.5	2.41-2.59	SP-SM	6.0	372	217	235	77	260
	0-6	31.2-31.9	9.51-9.72	SM	7.1	80	227	11	85	399
D-12	69.4-69.9	21.15-21.31	CL-NL	7.3	26	13	197	36	146	
P-15	120.1-120.6	36.61-36.76	SC-SM	7.3	47	15	241	94	275	
P-17	160.5-161.4	49.92-49.19	CL-NL	7.3	58	20	19	88	321	
HV-B-5	P-11	50.4-51.2	15.36-15.61	SC	7.3	98	19	11	141	315
HV-P-1	b-1	0.25-1.0	0.01-0.30	SM	7.3	80	11	52	80	313
HV-P-11	b-1	0.5-1.0	0.15-0.30	SM	7.4	29	20	179	103	408
HV-P-21	b-1	0.5-1.0	0.15-0.30	SM	7.2	17	14	411	88	280
HV-CS-10	b-1	0.5-1.5	0.15-0.46	SM	7.4	84	119	11	39	150
HV-CS-27	b-1	0.25-0.75	0.01-0.23	SM	7.4	28	14	183	78	365
HV-CS-57	b-1	0.25-1.0	0.01-0.30	SC-SM	7.3	482	109	1746	86	314

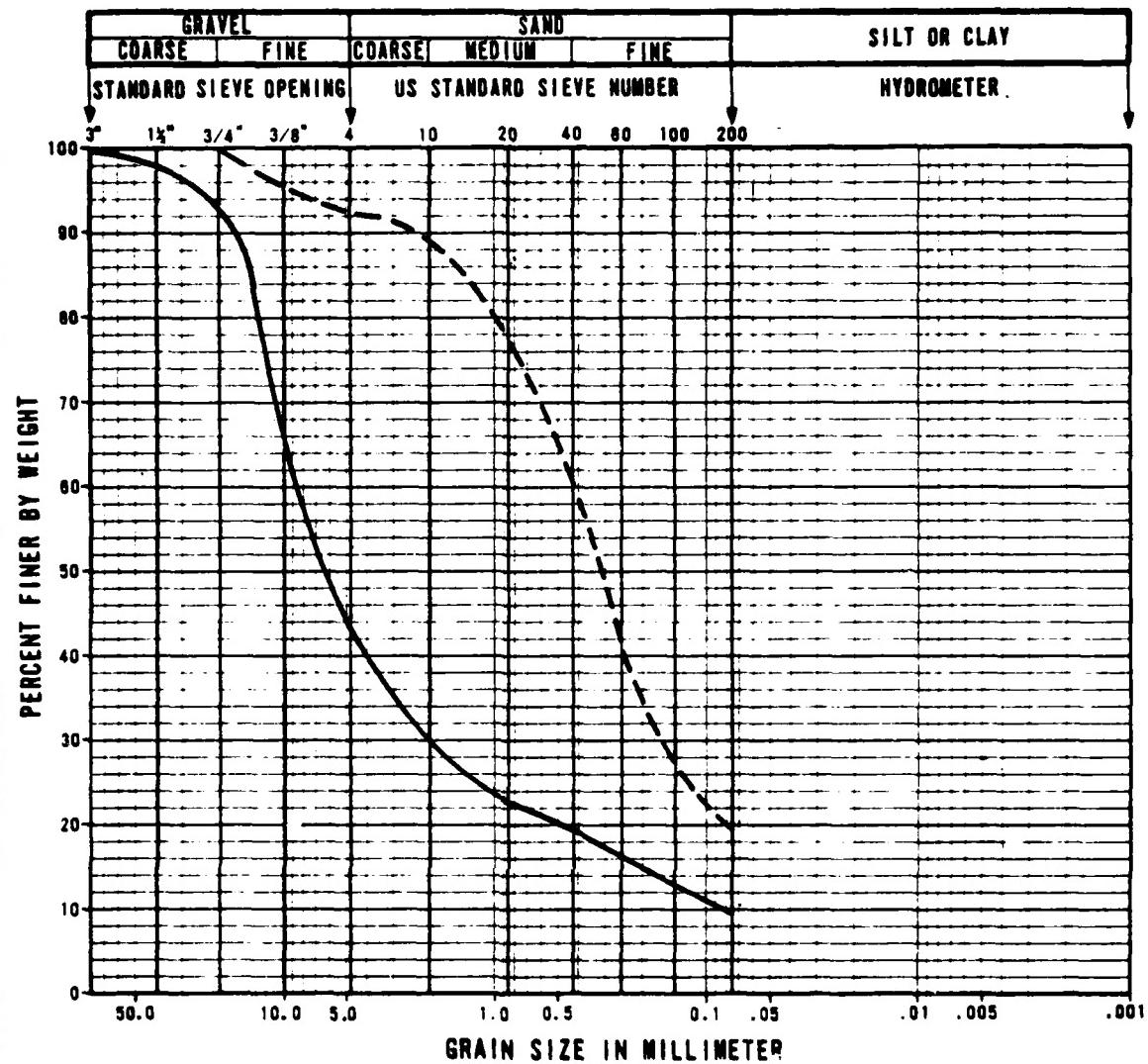
SUMMARY OF CHEMICAL TEST RESULTS  
VERIFICATION SITE, HAMLIN VALLEY CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE  
9-6

**FUGRO NATIONAL, INC.**

CHECKED BY \_\_\_\_\_ APPROVED BY \_\_\_\_\_



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
—	E	HV-T-11	0.1-2.0	0.03-0.60	GP-GM
- - -	F	HV-T-8	0.5-1.5	0.15-0.46	SM

GRAIN SIZE CURVES, CBR TESTS  
VERIFICATION SITE, HAMLIN VALLEY COP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
9-2  
2 OF 2

FUGRO NATIONAL INC.

AFV-12

CHECKED BY \_\_\_\_\_ APPROVED BY \_\_\_\_\_

COMPOSITE SAMPLE NUMBER	SOIL TYPE	ATTEBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY pcf	OPTIMUM MOISTURE CONTENT (%)	COMPACTED DRY DENSITY pcf	MAXIMUM DRY DENSITY kg/m <sup>3</sup>	PERCENT OF CBR
		LL	PI						
A	SM	22	NP		127.2	2038	10.8	109.8	13
B	SM	14				133.7	2142	7.9	
C	SM	29	NP		129.5	2074	9.0	109.5	12
D	SC-SM	36	31		116.1	1660	13.5	94.0	3

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS  
VERIFICATION SITE, HAMLIN VALLEY CDP, NEVADAMX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSOTABLE  
9-7  
1 OF 2

FUGRO NATIONAL, INC.

AFV-13

APPROVED AS  
CIRCUMSTANTIAL EVIDENCE

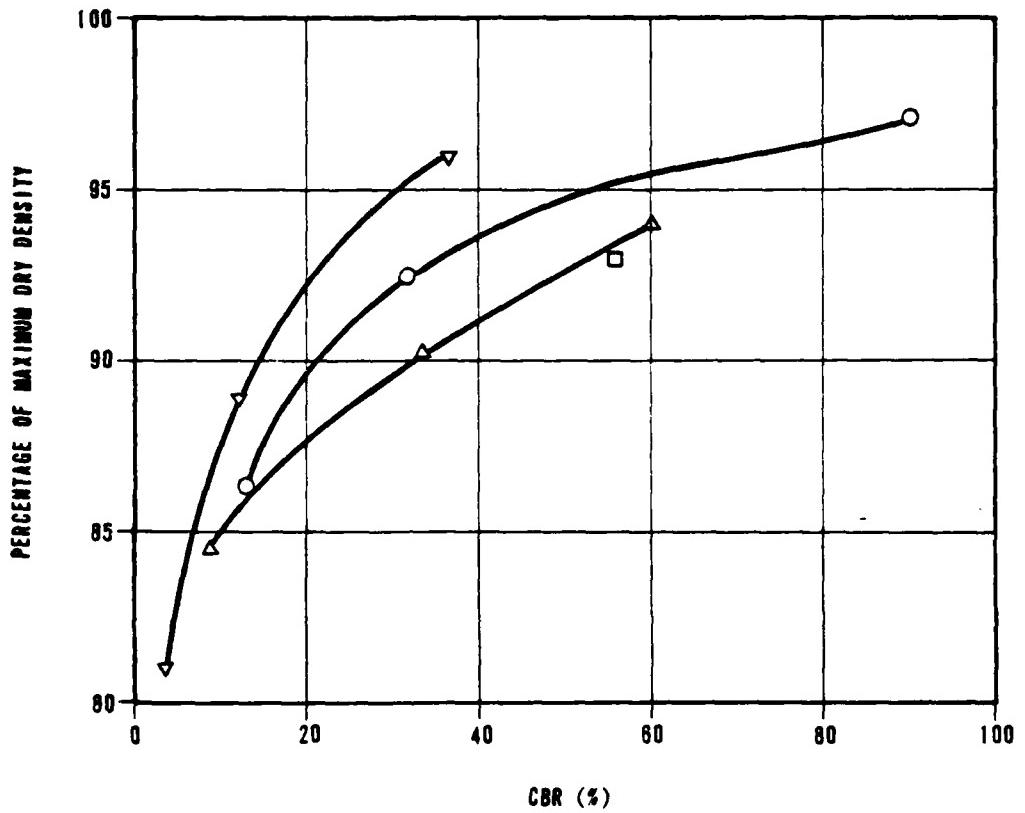
CALIFORNIA BEARING RATIO (CBR) TEST RESULTS  
VERIFICATION SITE, HAMLIN VALLEY COP., NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE  
9-7  
2 OF 2

**FUERO NATIONAL, INC.**

2 JUL 79



CHECKED BY \_\_\_\_\_ APPROVED BY \_\_\_\_\_

SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	A	SM
□	B	SM
△	C	SM
▽	D	SC-SM

CALIFORNIA BEARING RATIO (CBR) CURVES  
VERIFICATION SITE, HAMLIN VALLEY COP, NEVADA

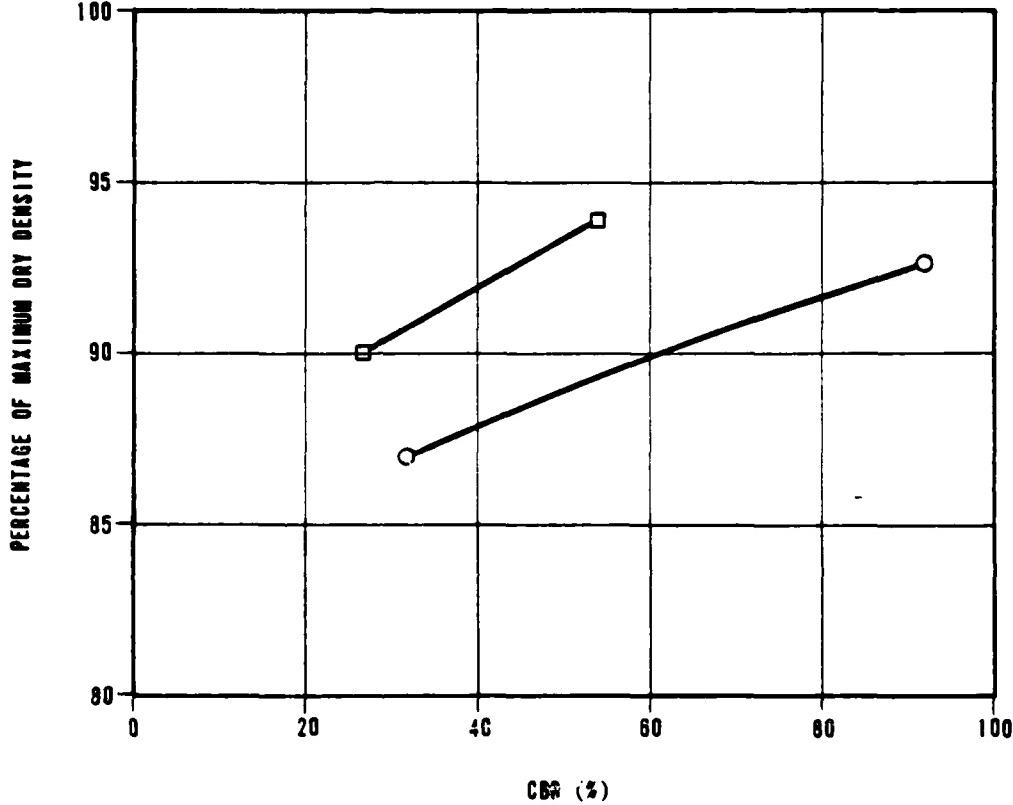
MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE  
9-3  
1 OF 2

FUGRO NATIONAL, INC.

AFV-14

CHECKED BY \_\_\_\_\_ APPROVED BY \_\_\_\_\_



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	E	GP-GM
□	F	SM

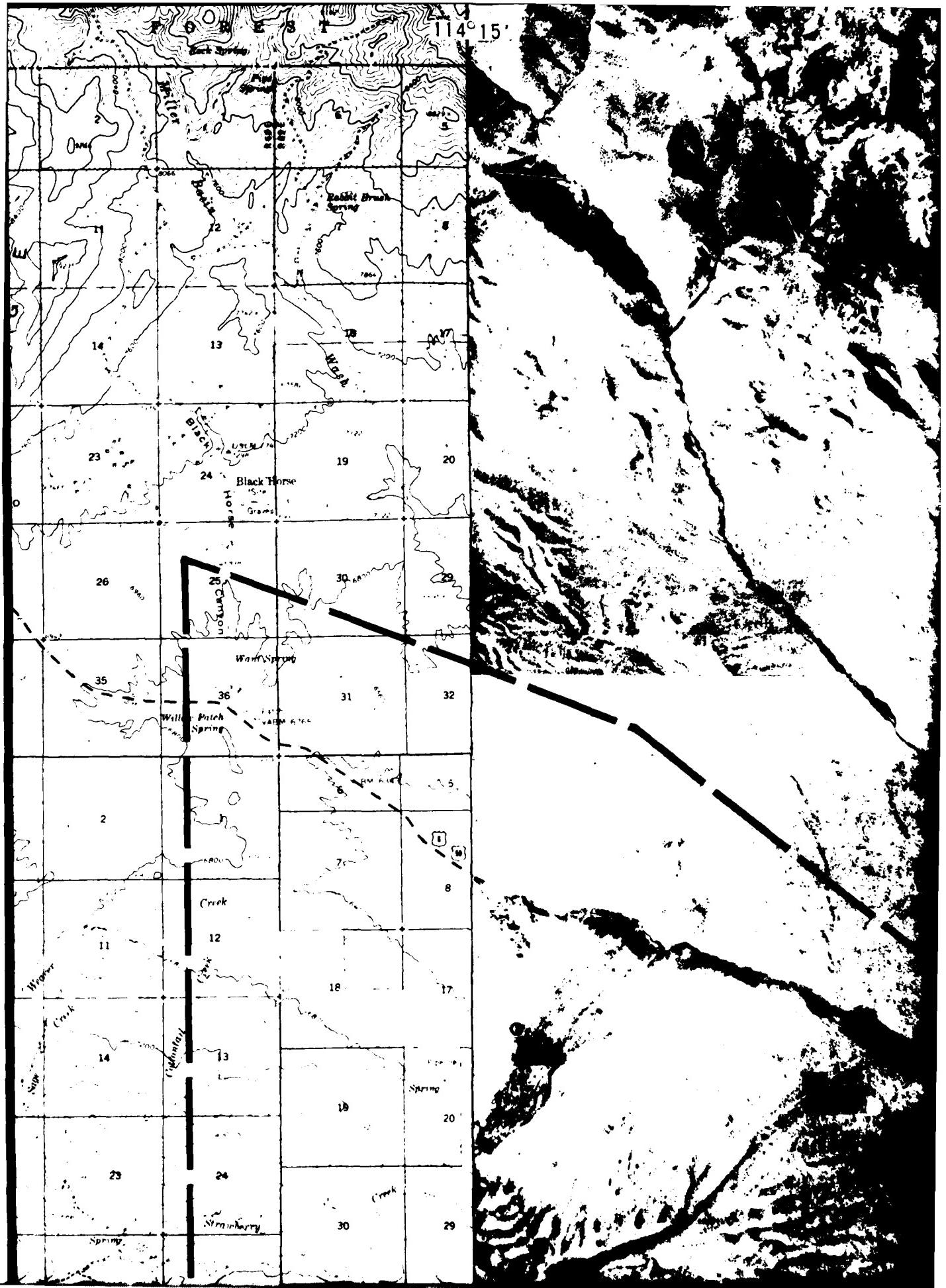
CALIFORNIA BEARING RATIO (CBR) CURVES  
VERIFICATION SITE, HAMLIN VALLEY CDP, NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

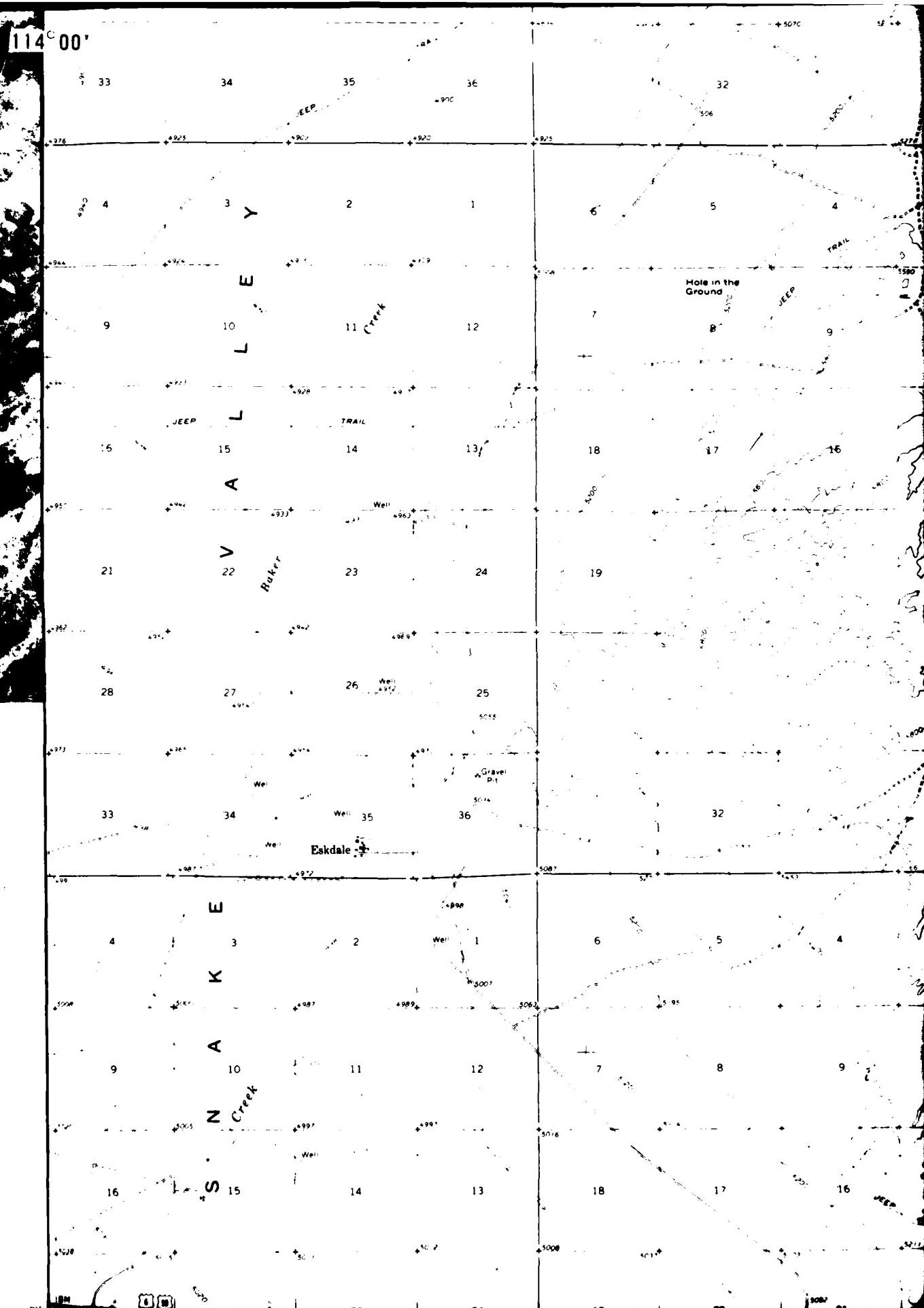
FIGURE  
9-3  
2 OF 2

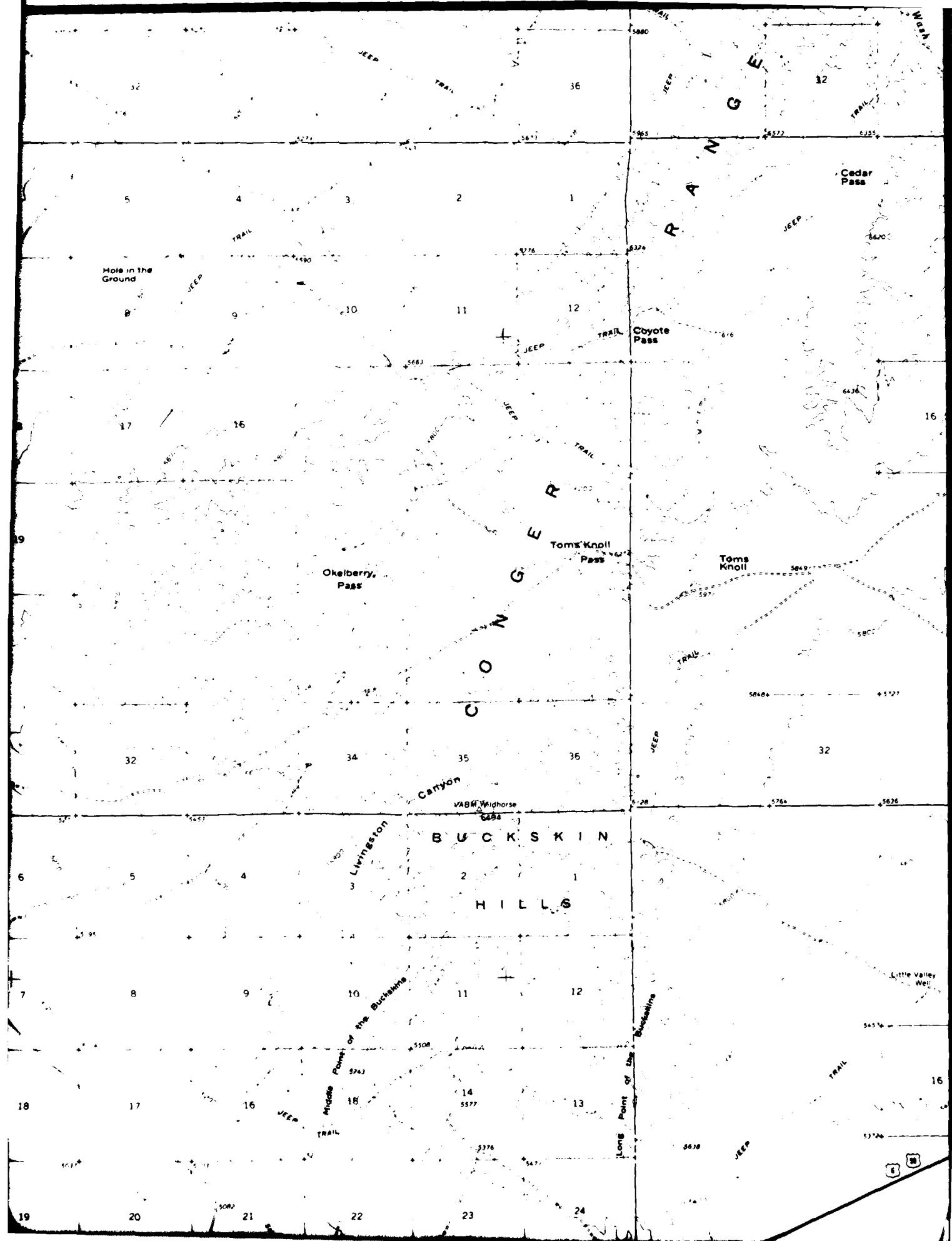
**FUGRO NATIONAL, INC.**

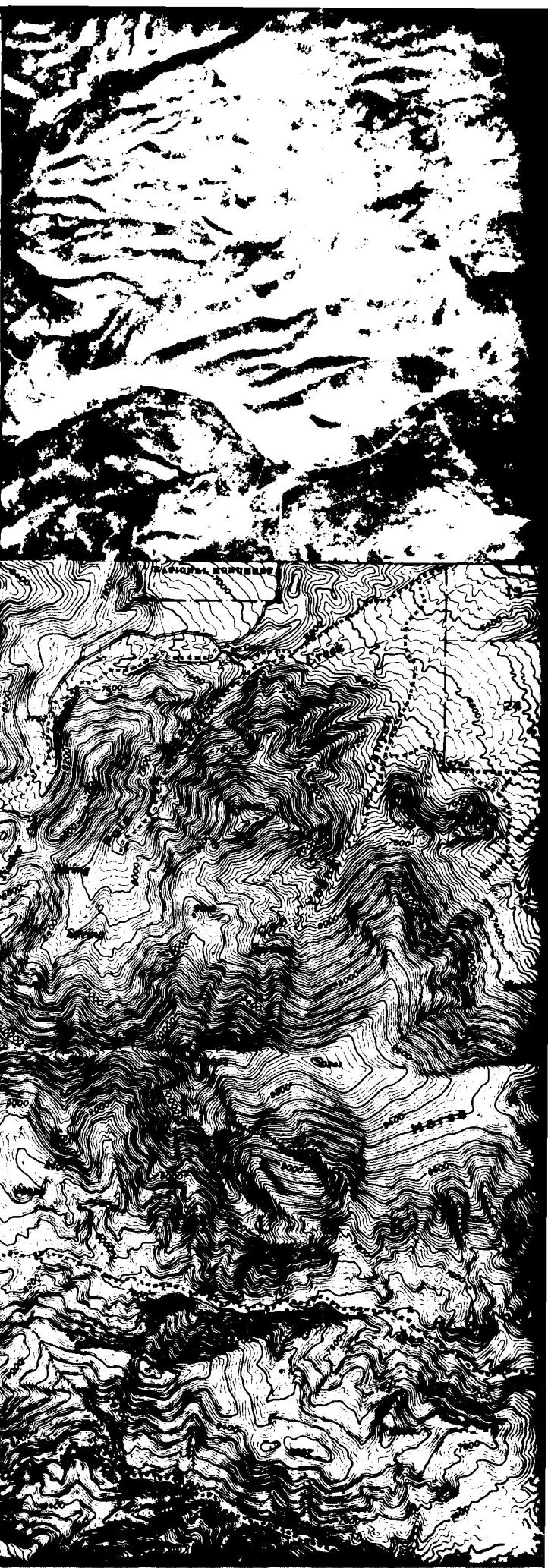
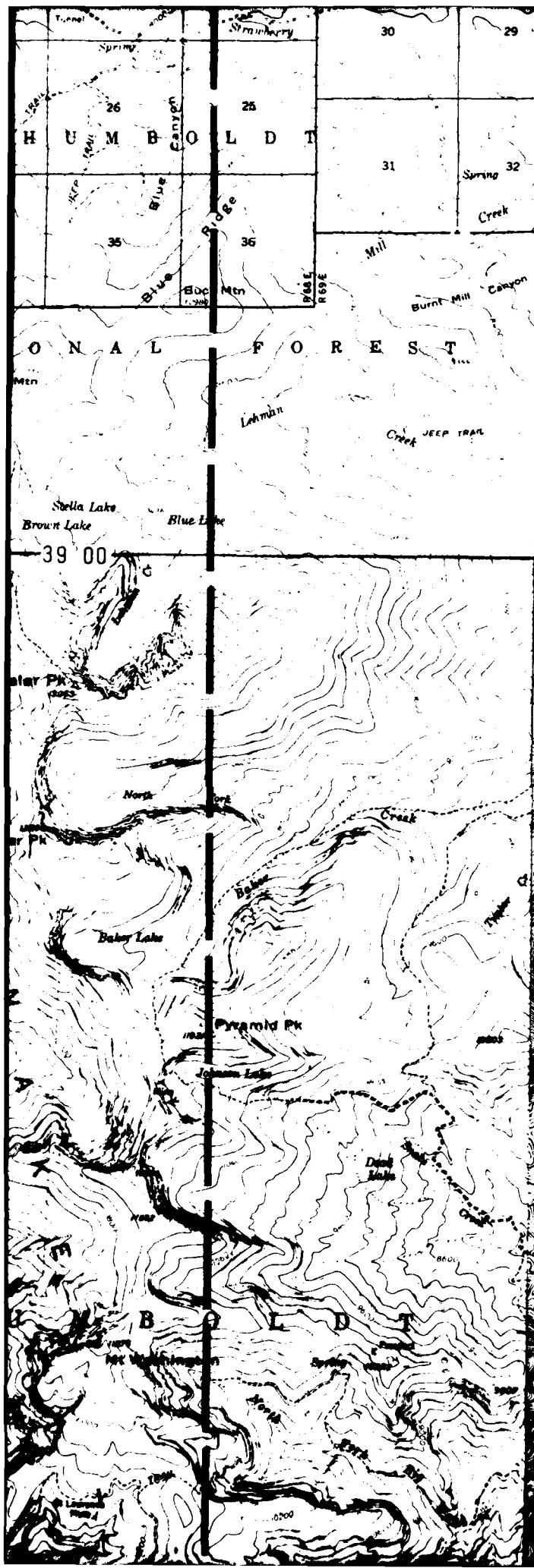
AFV-14

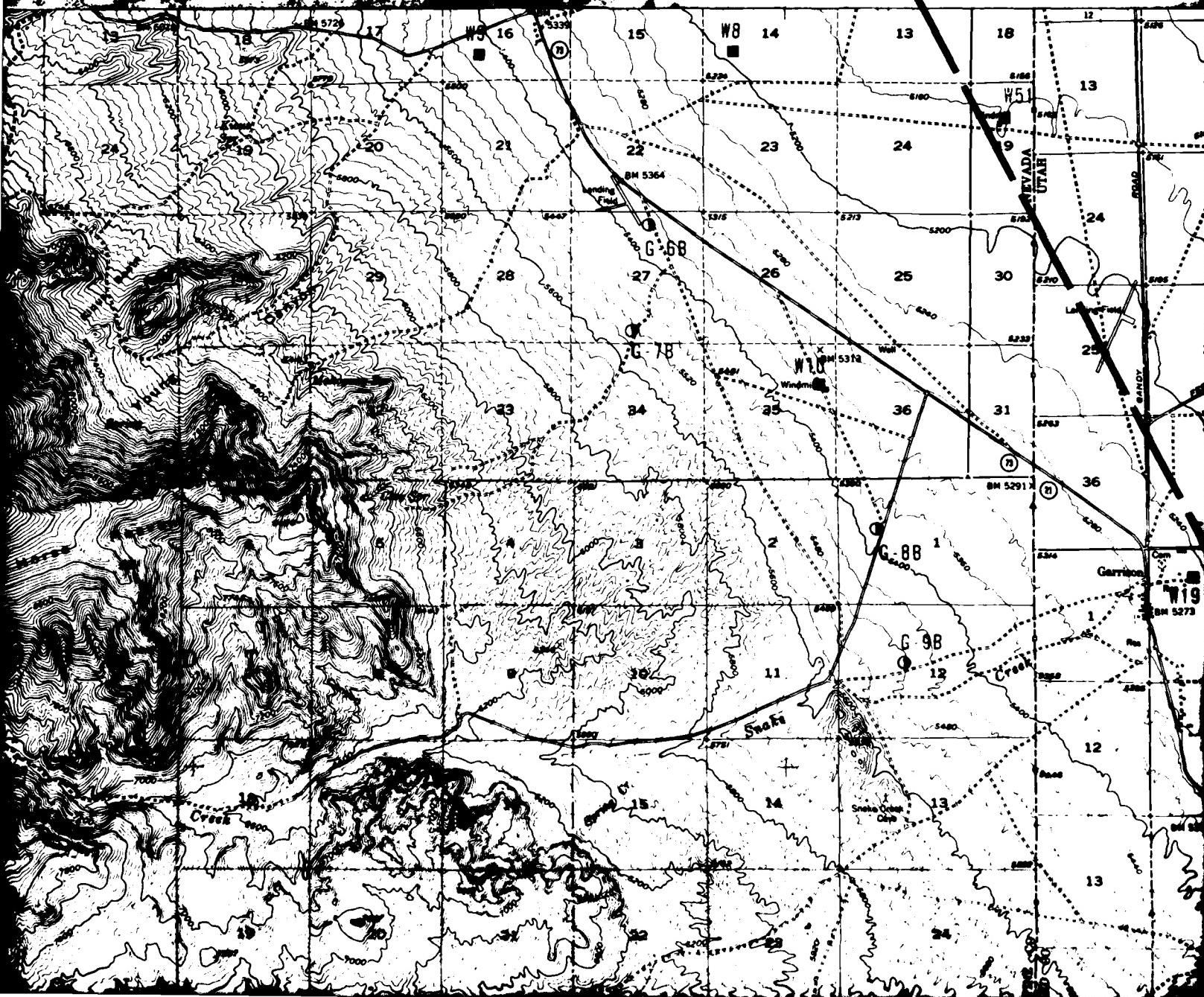


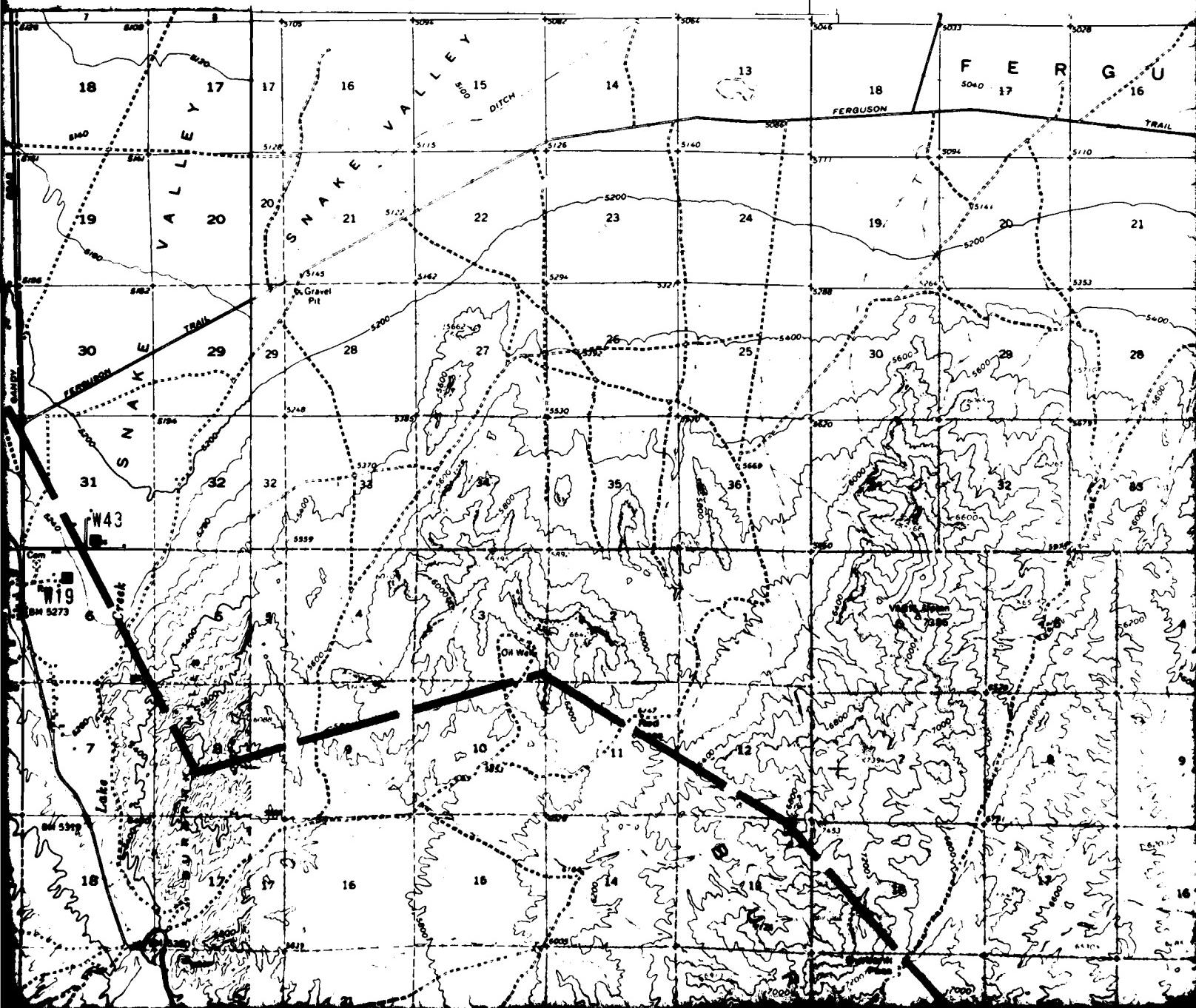
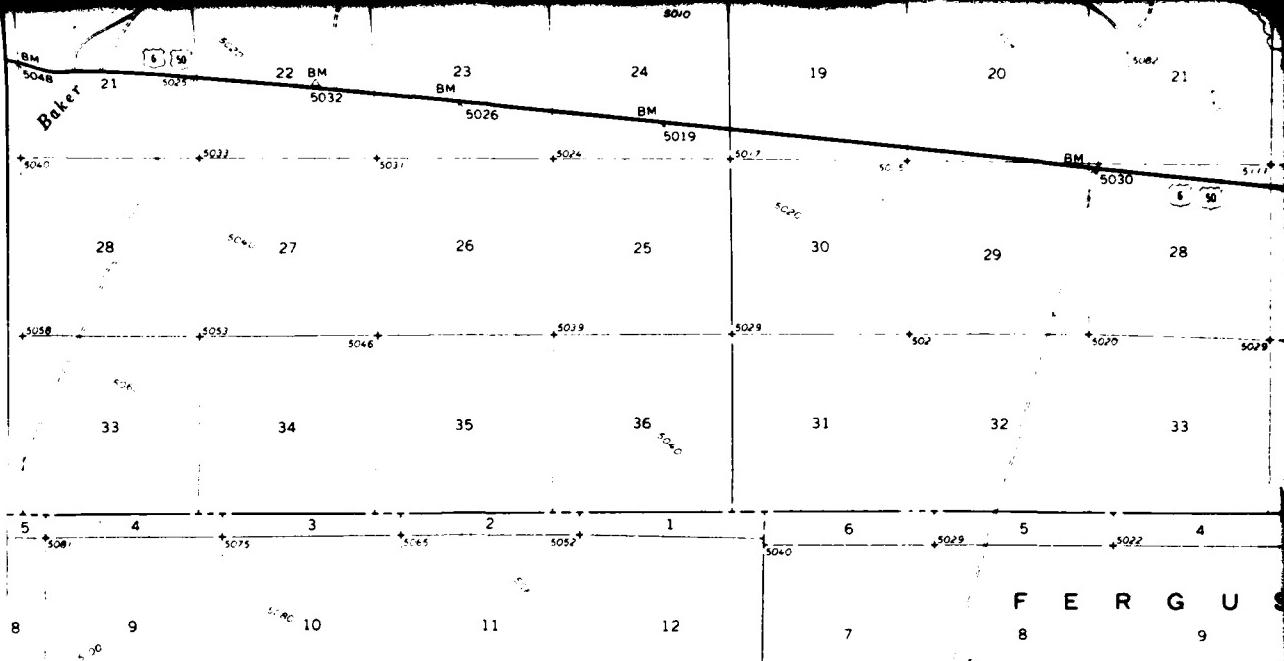


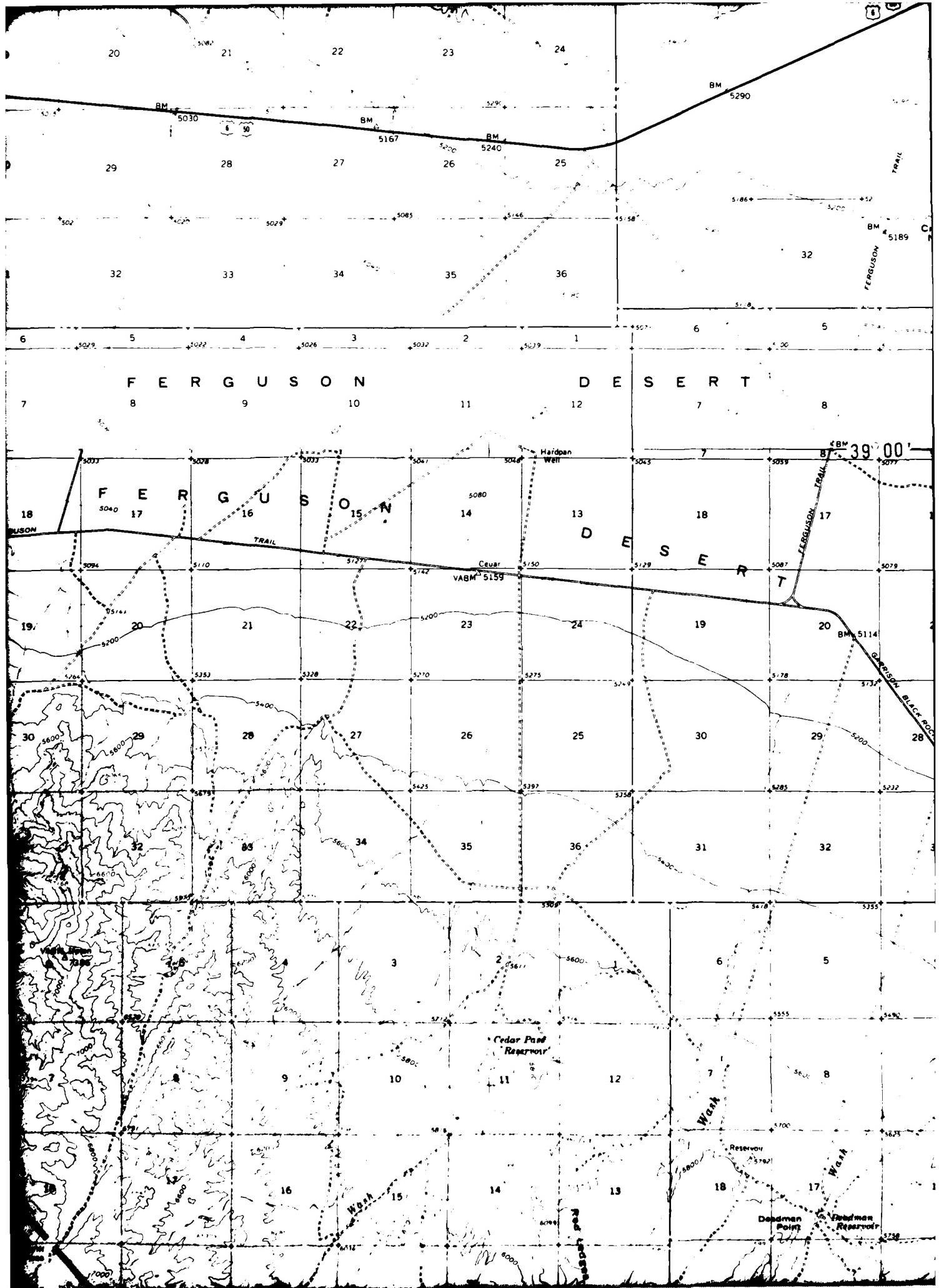


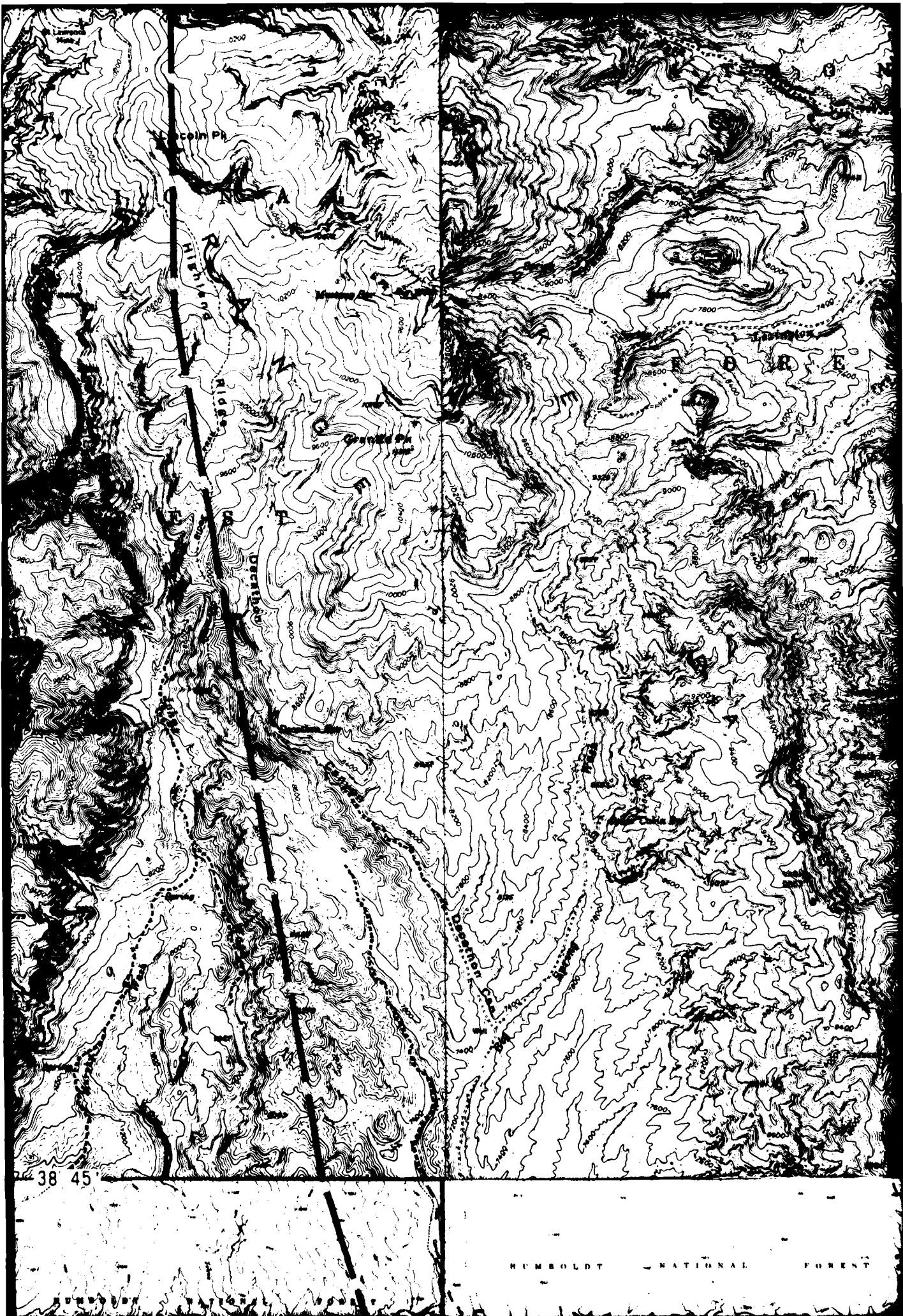


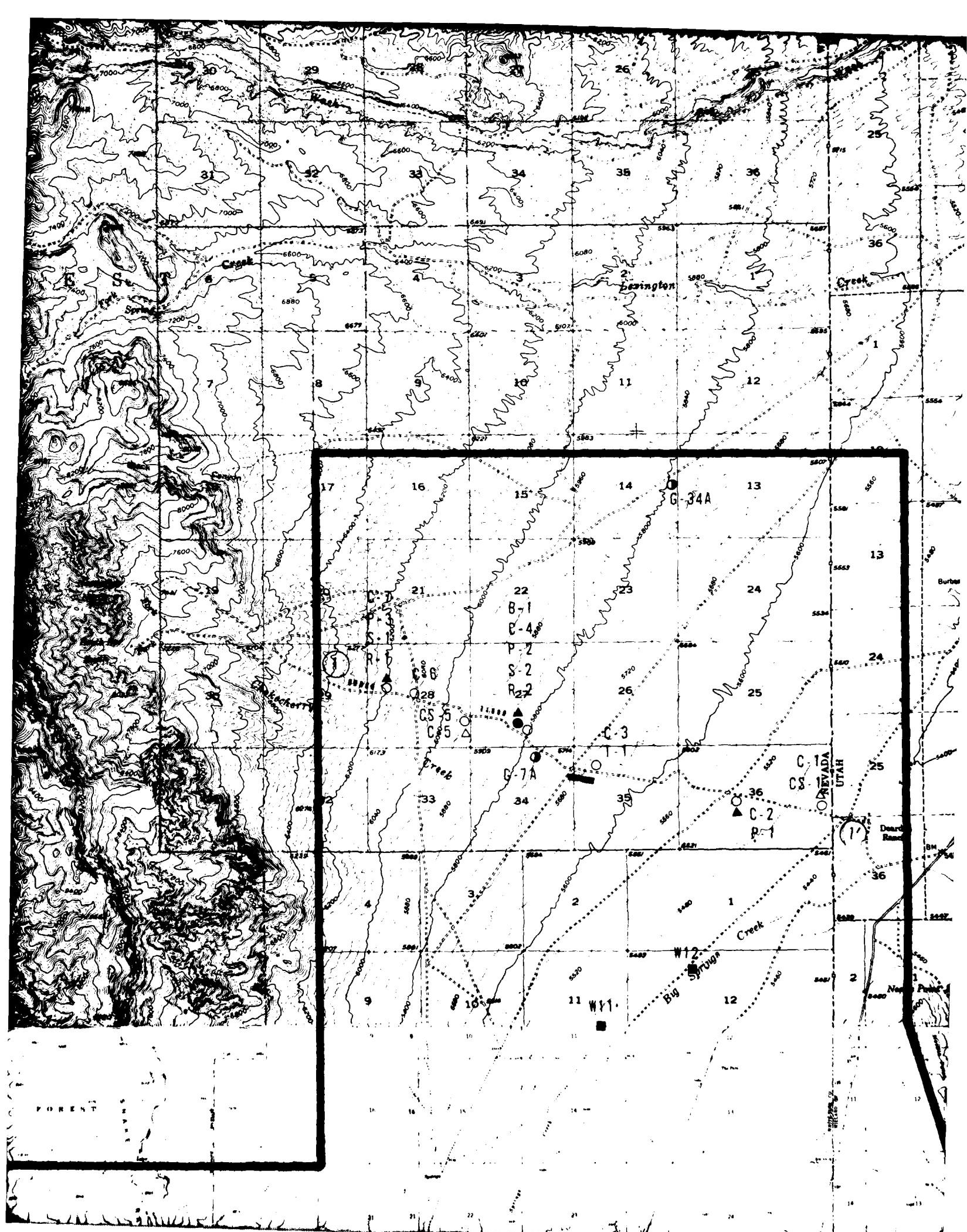


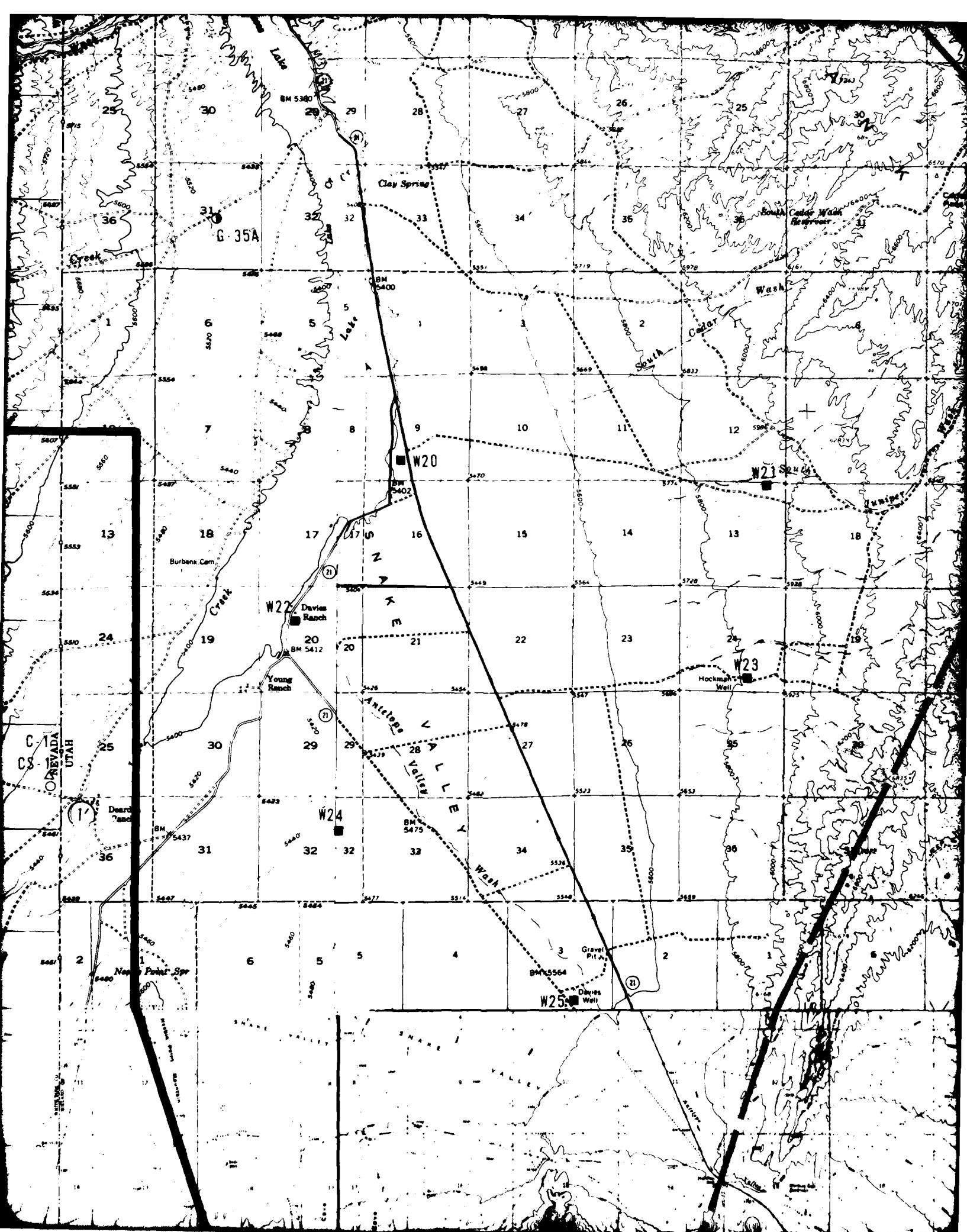


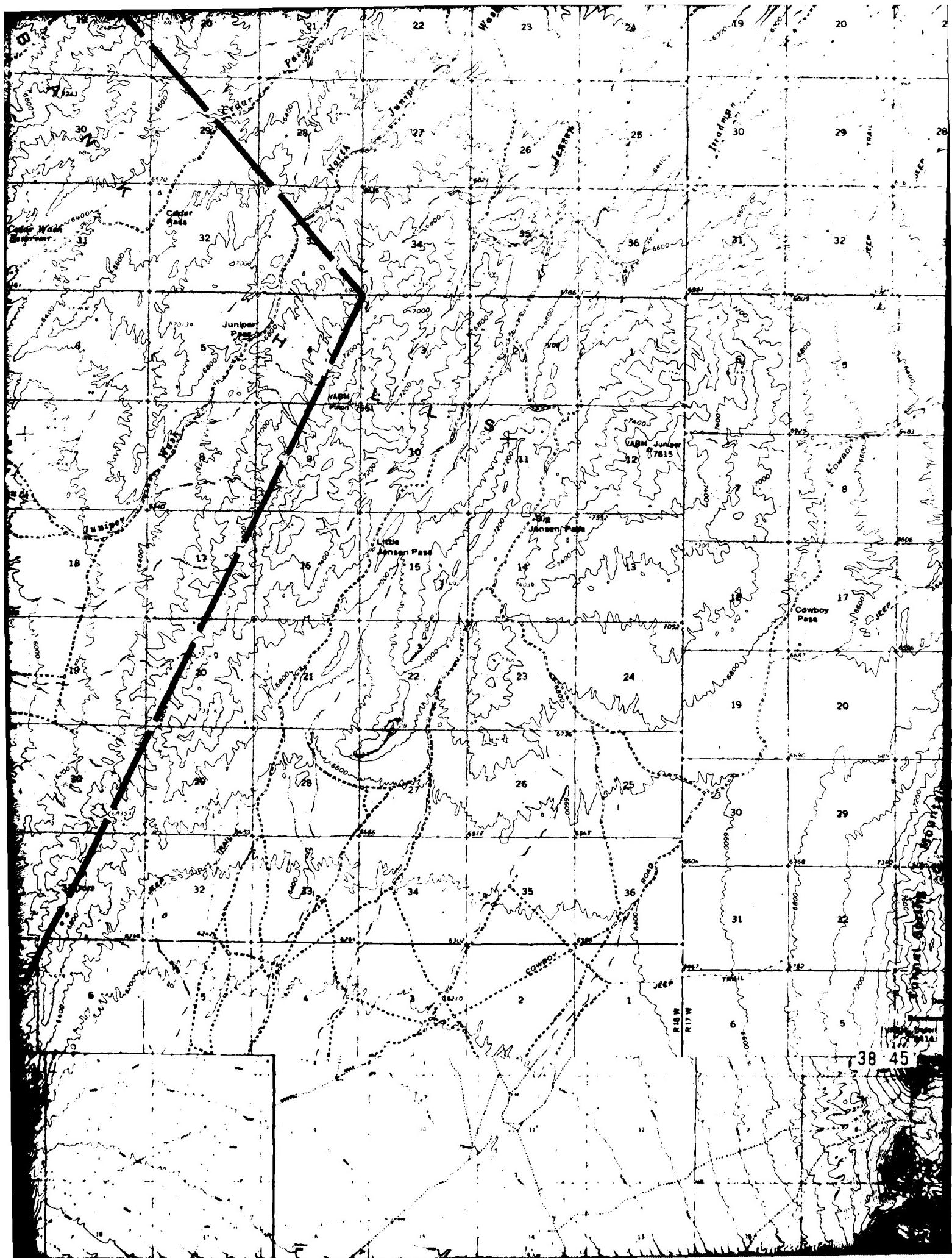


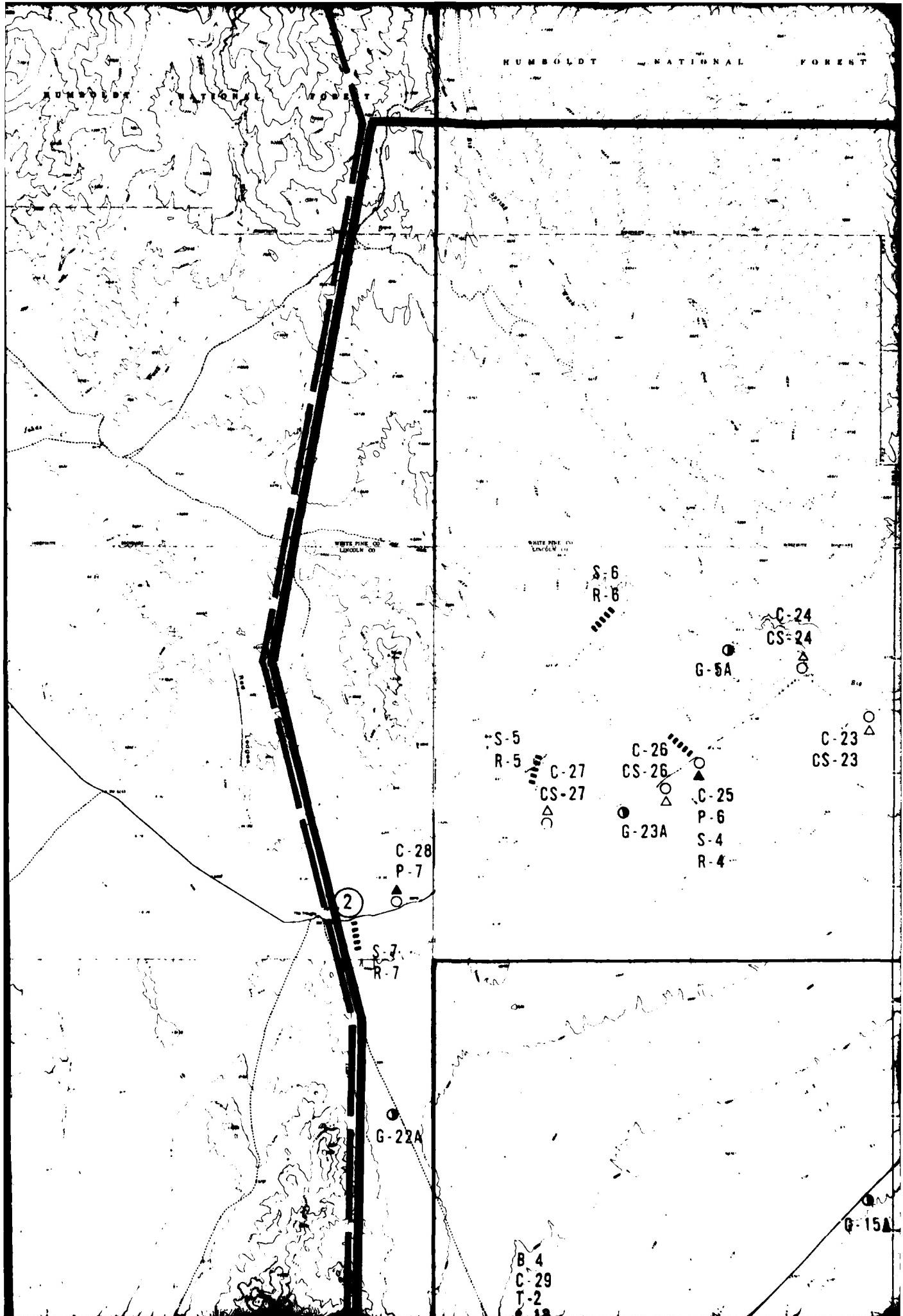


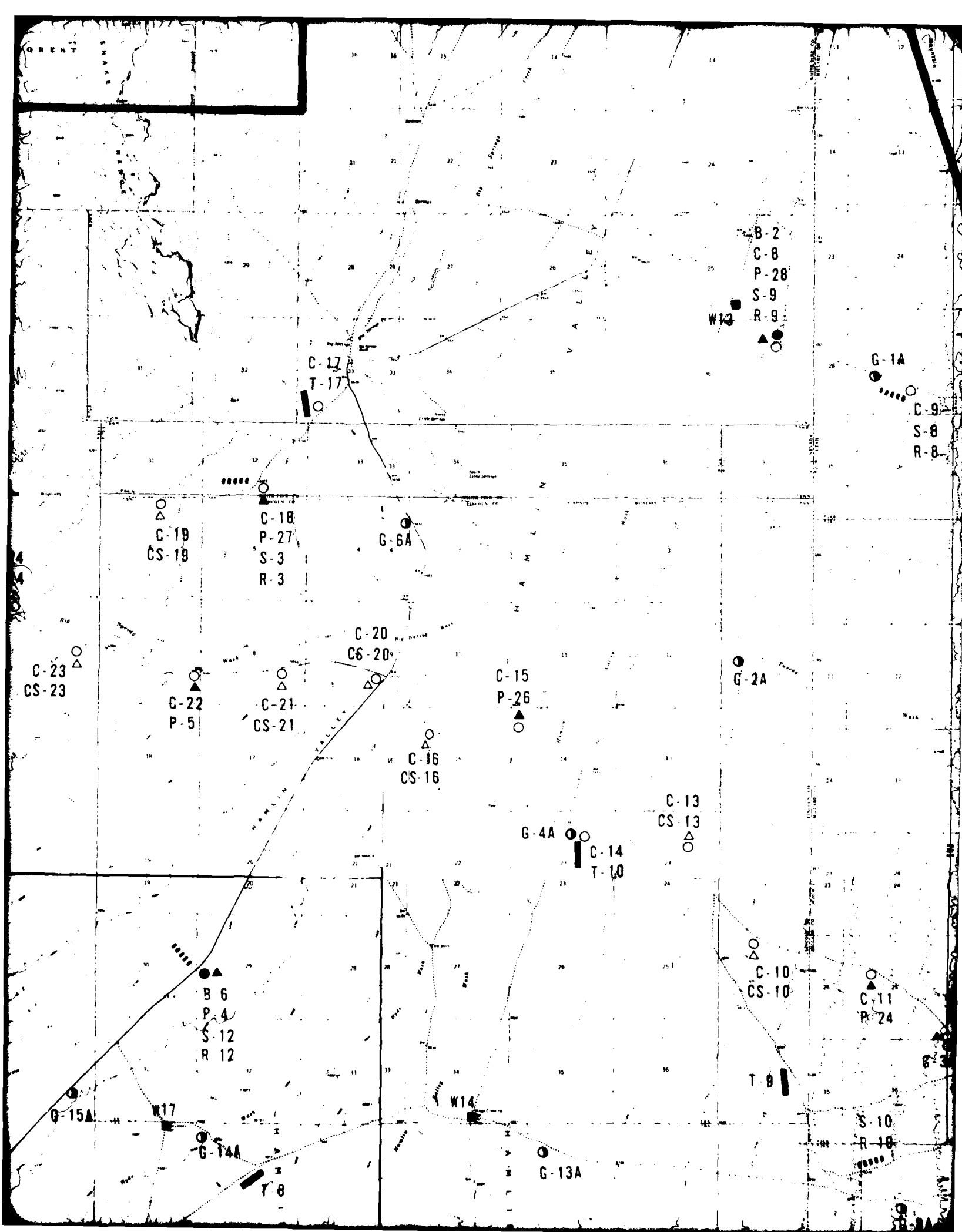


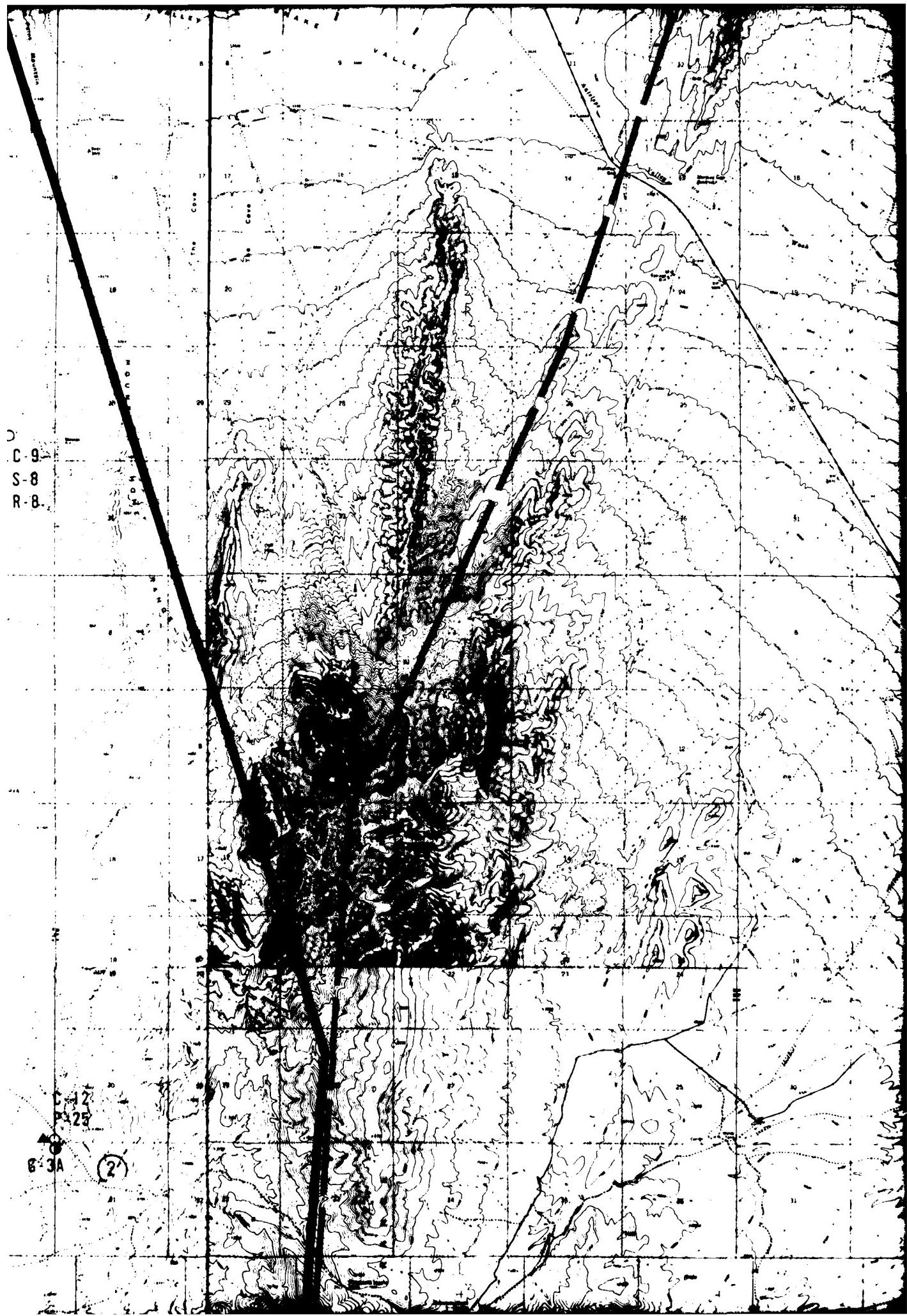


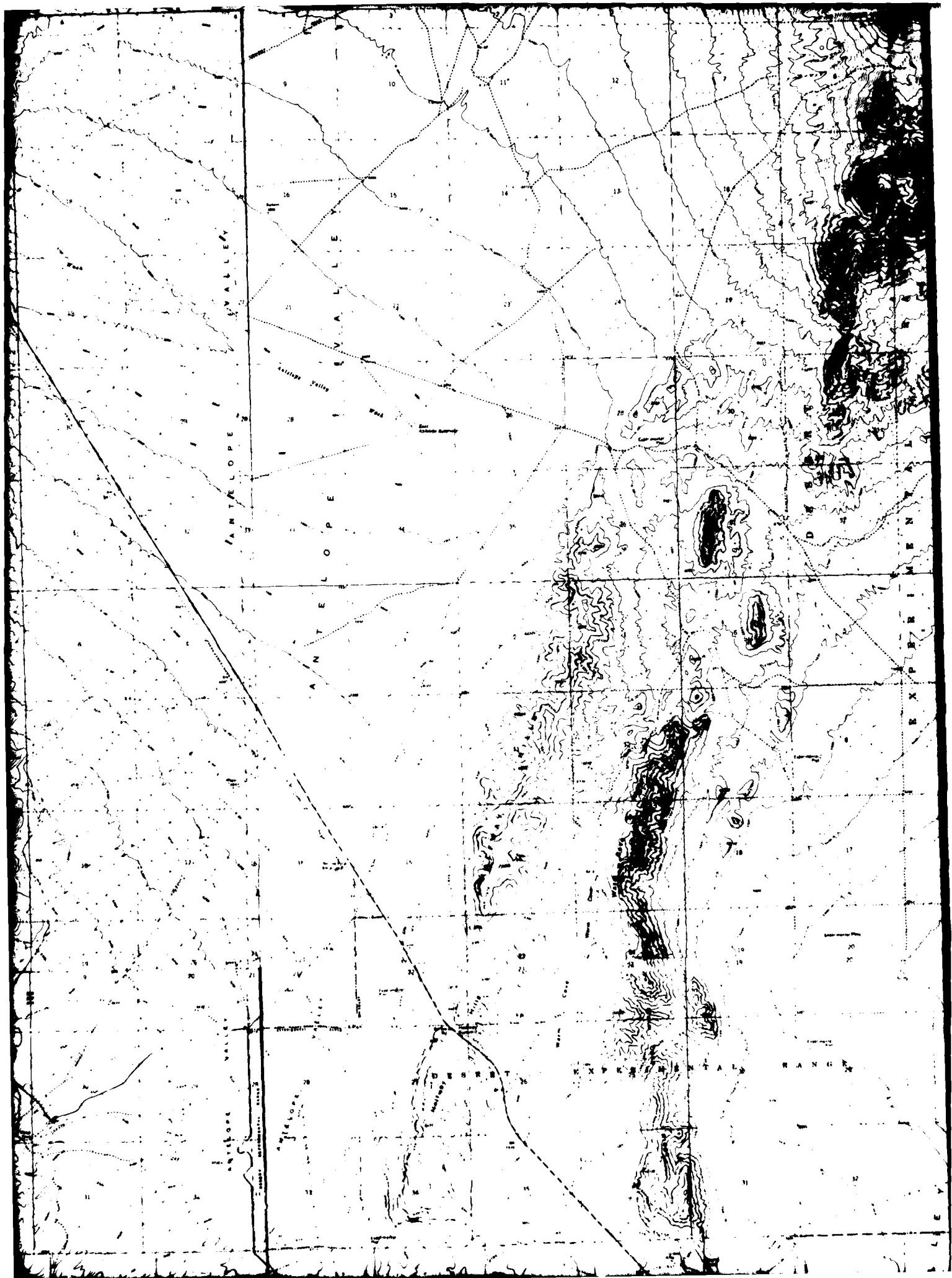


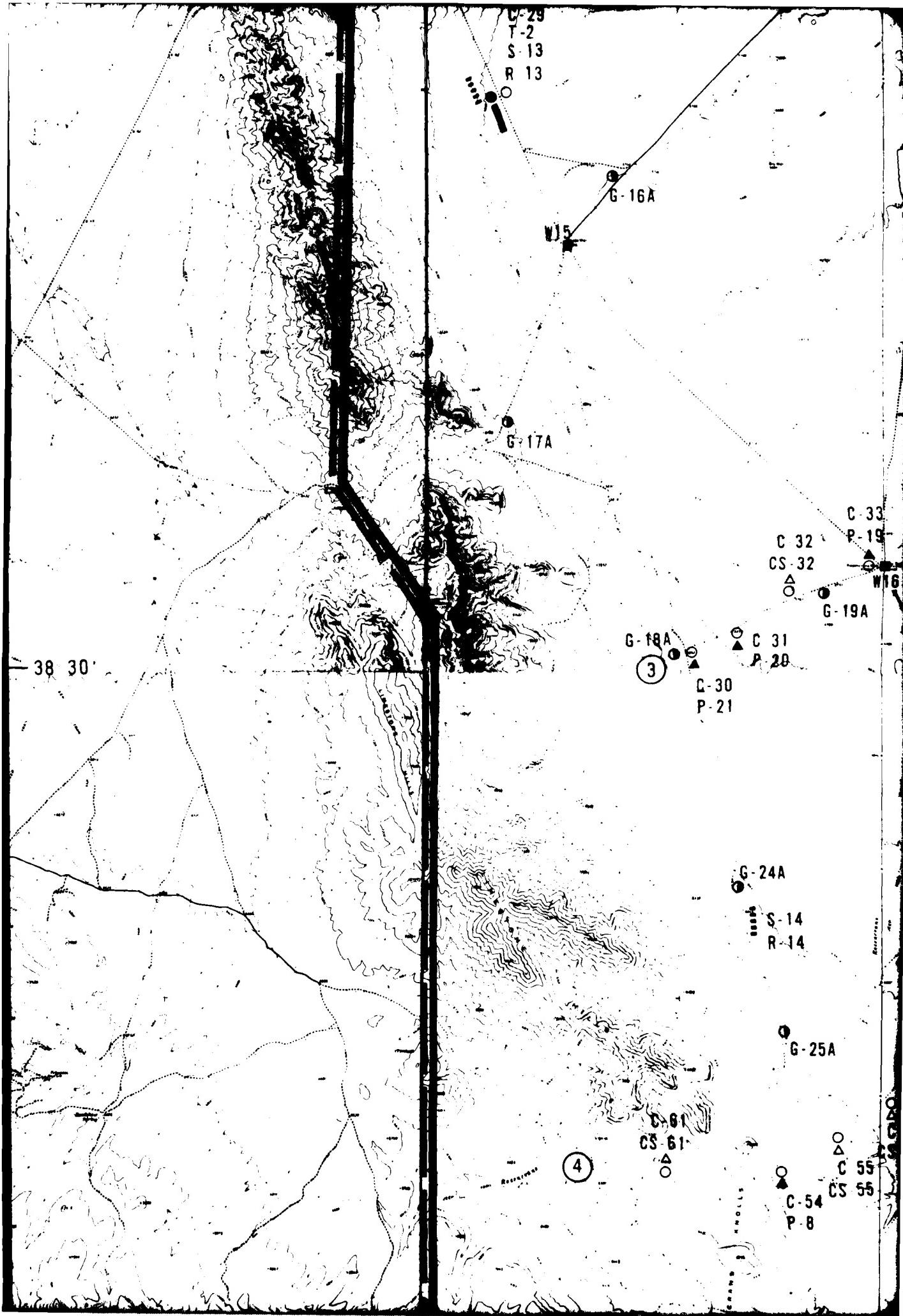


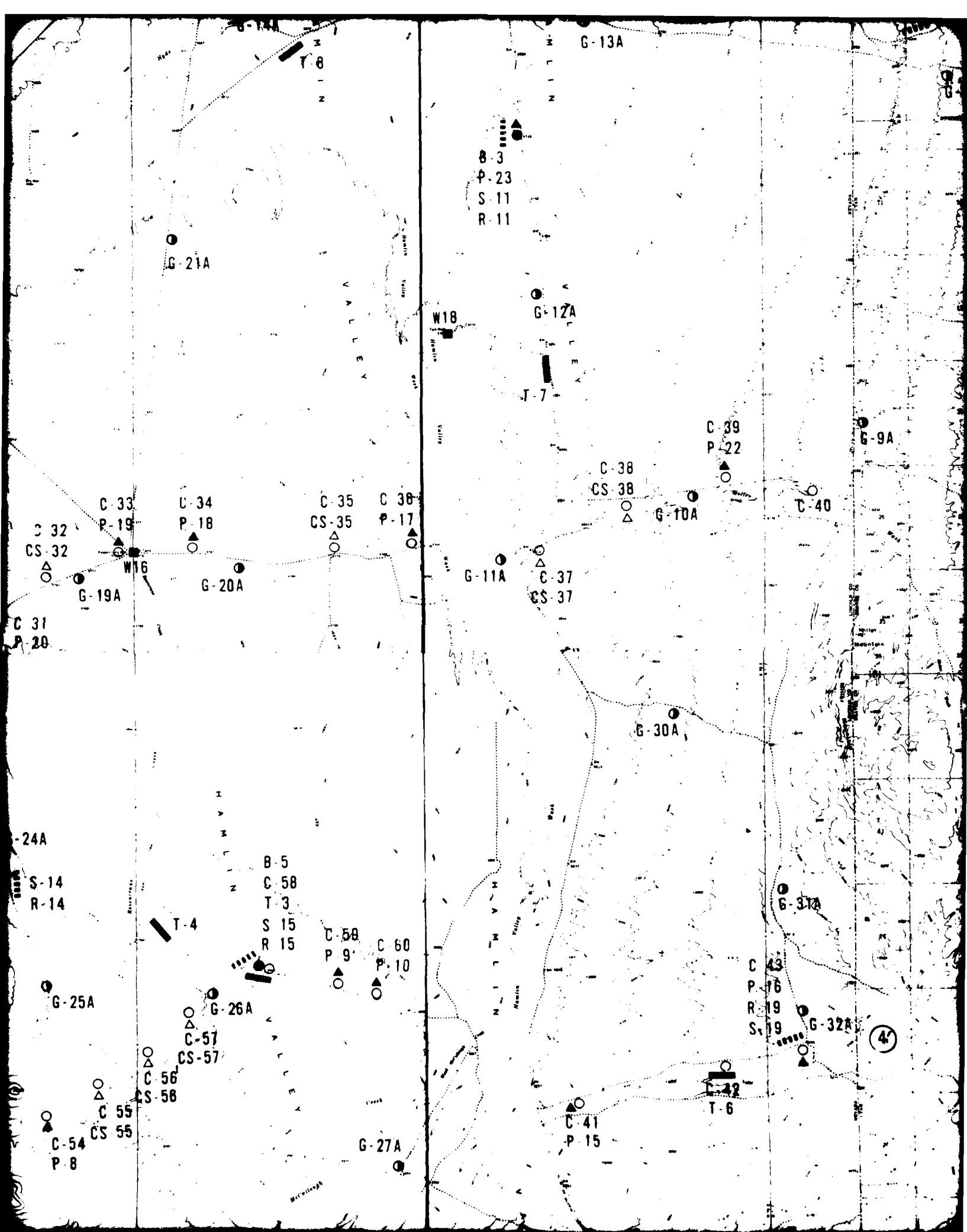


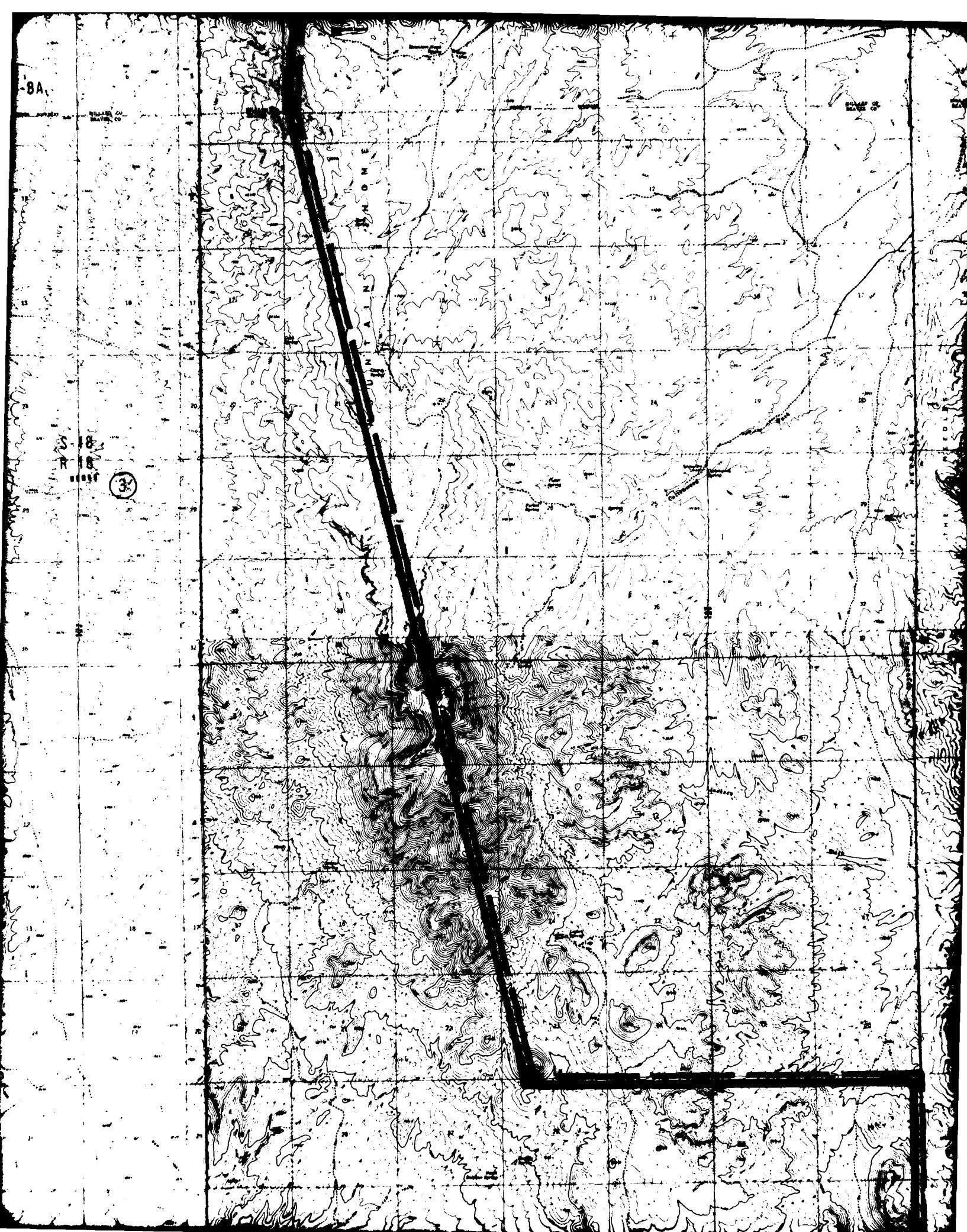


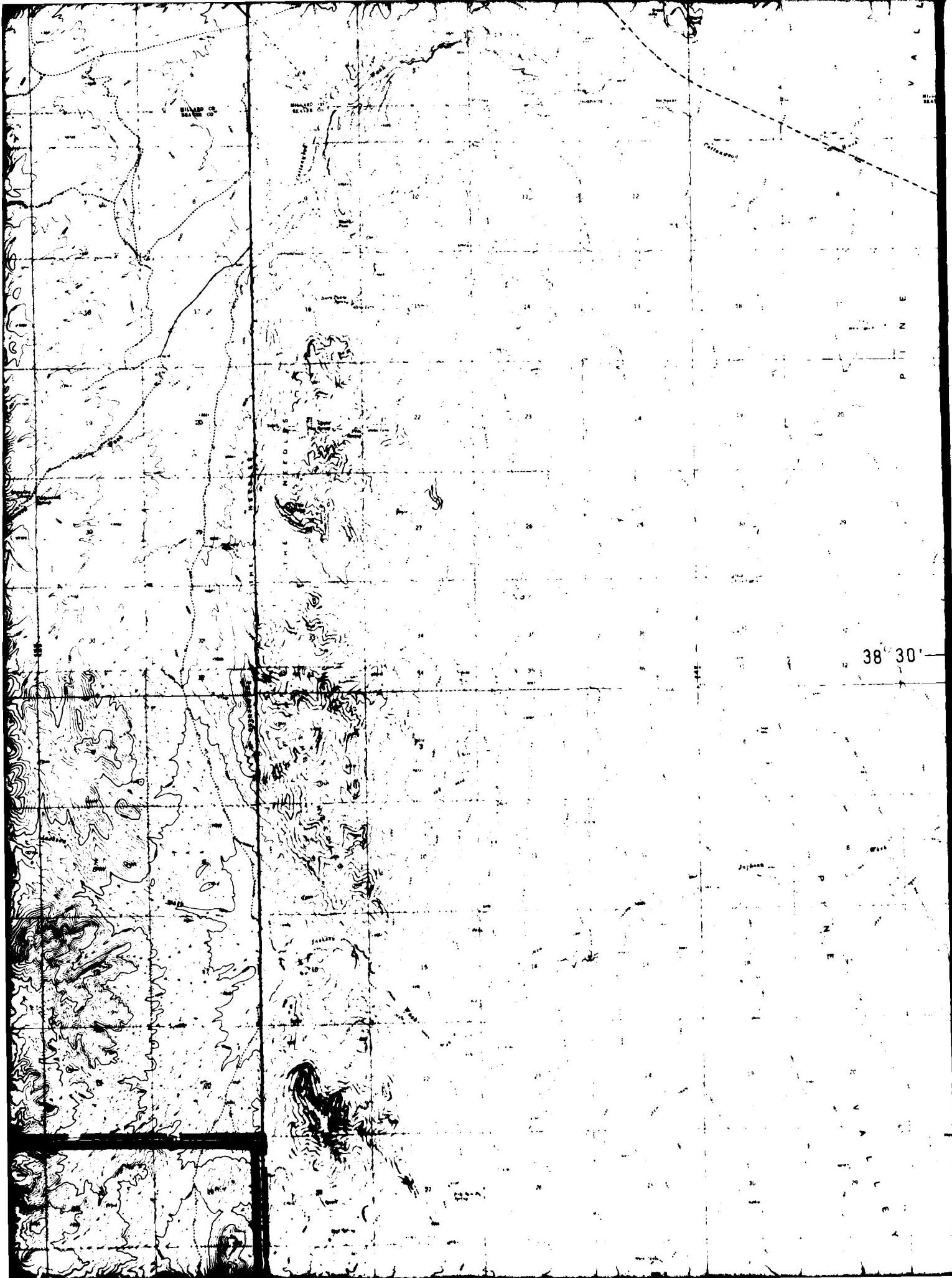










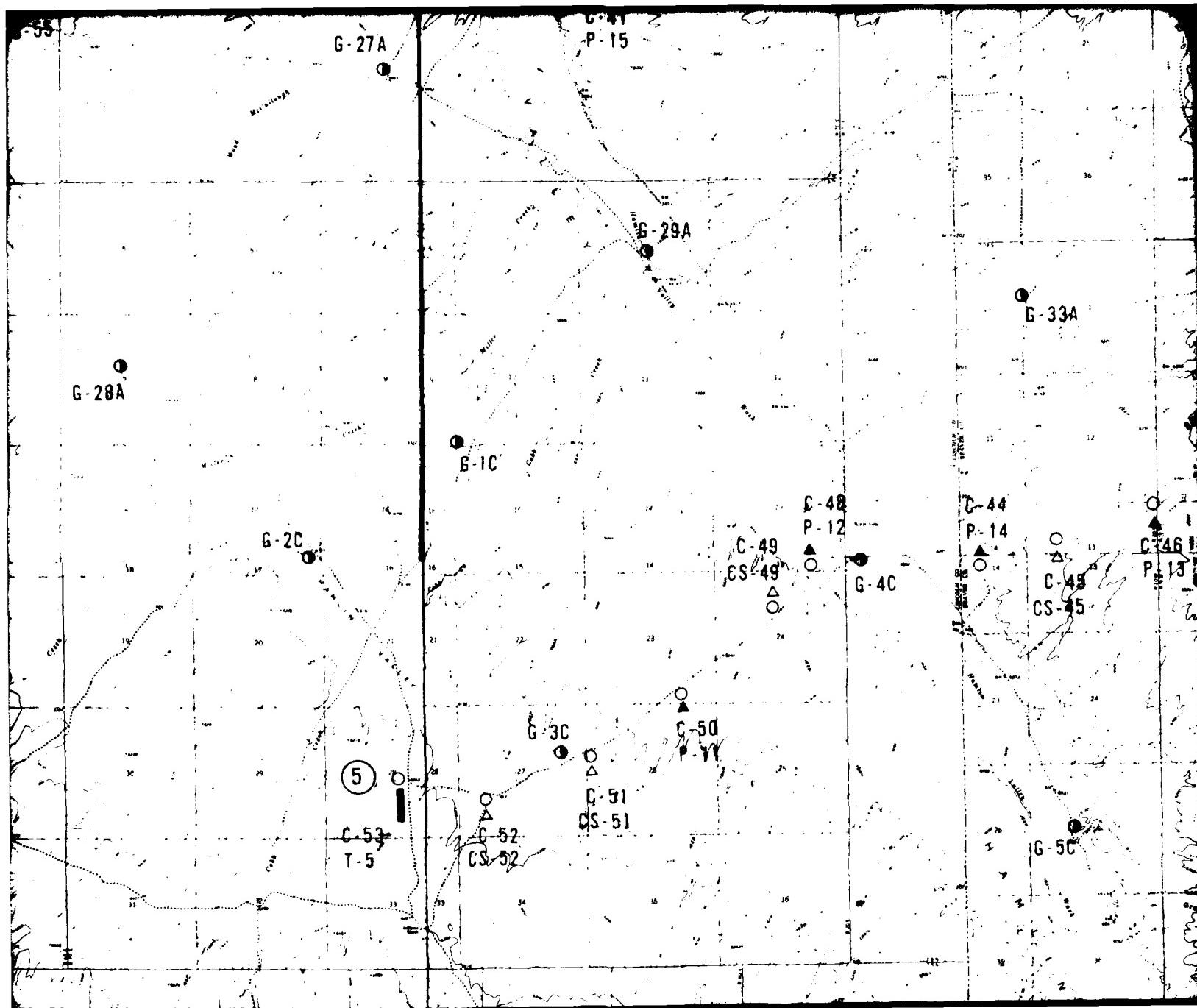


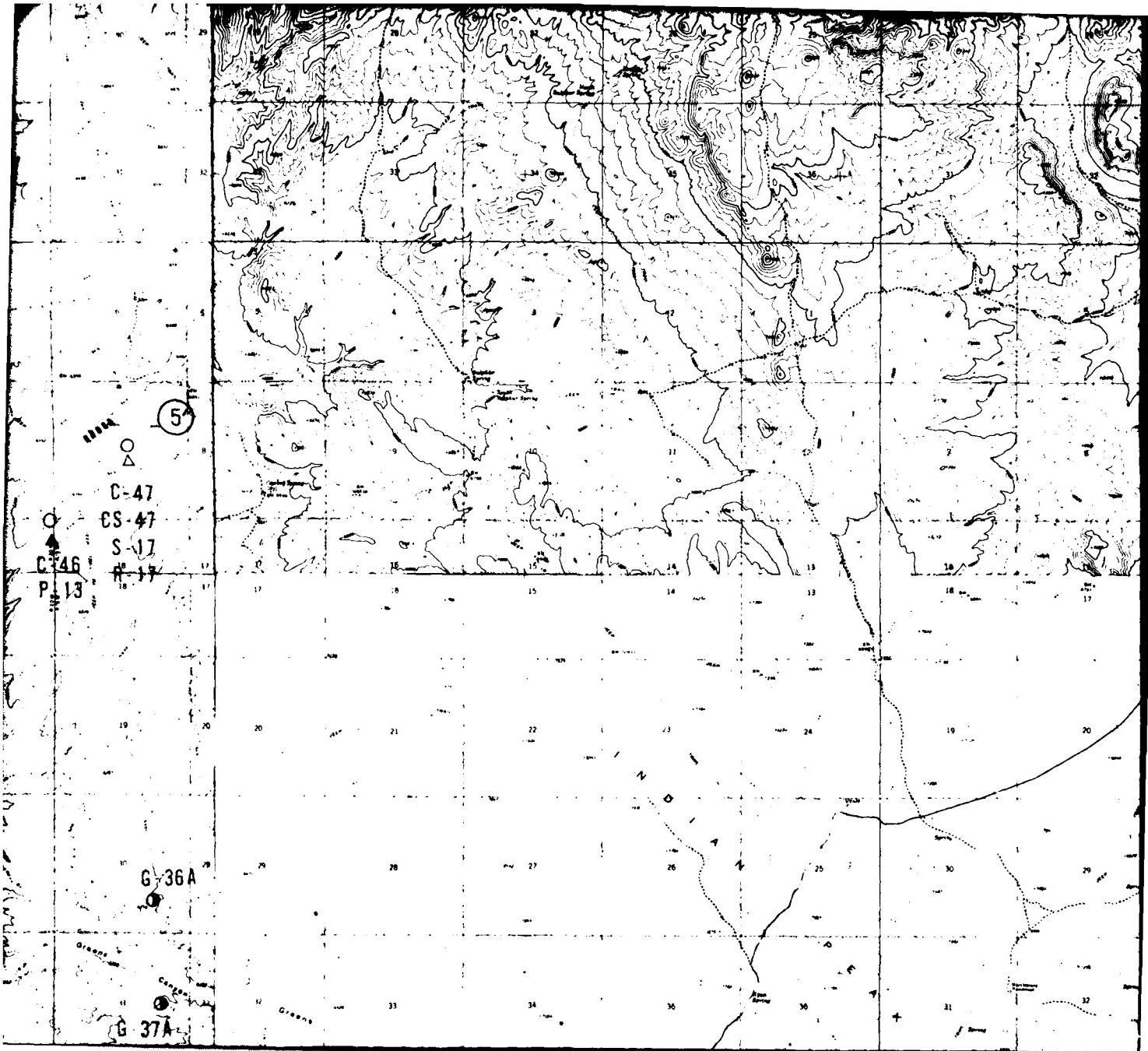
C-54  
P-8

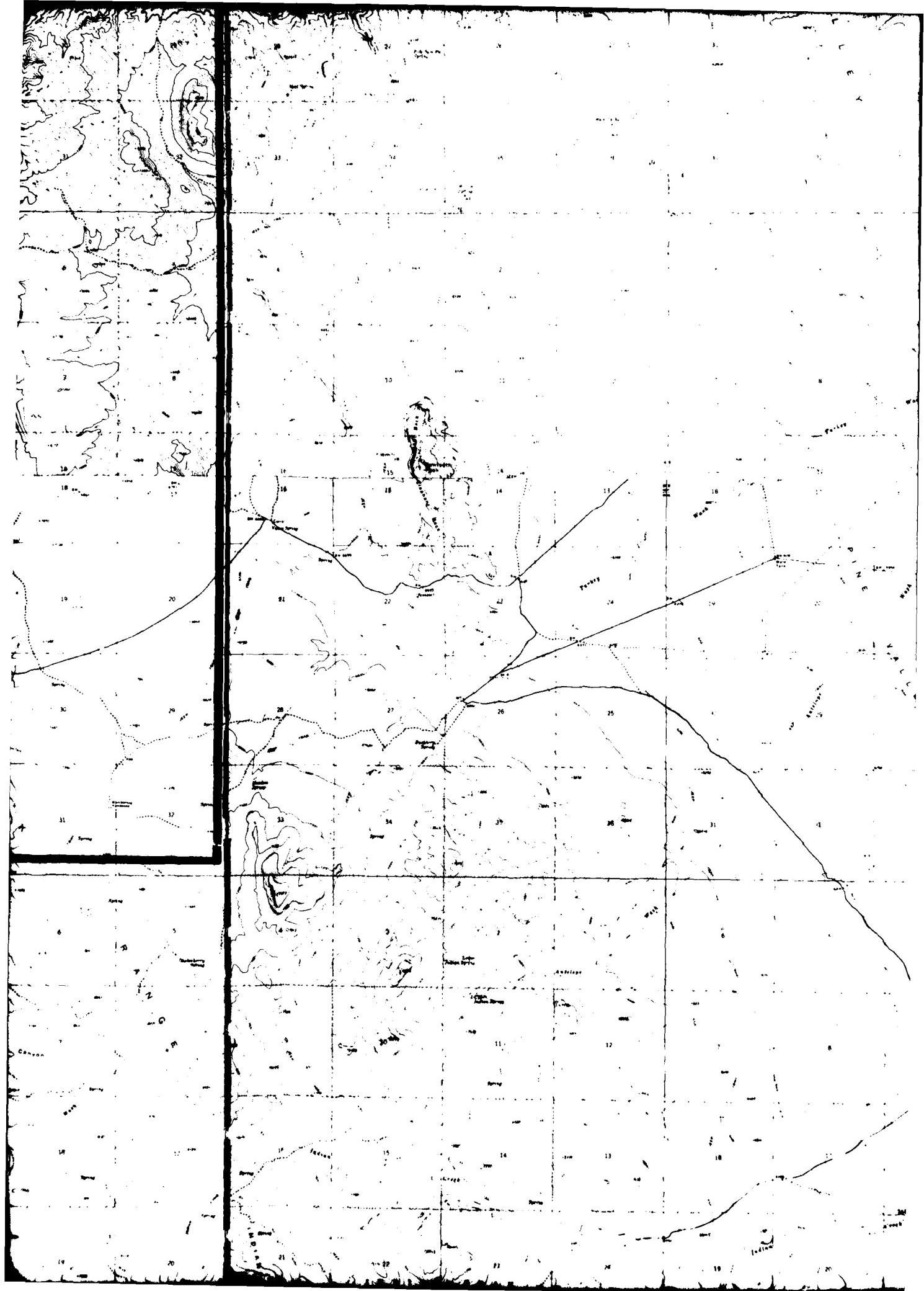
S-16  
R-16

G-6C

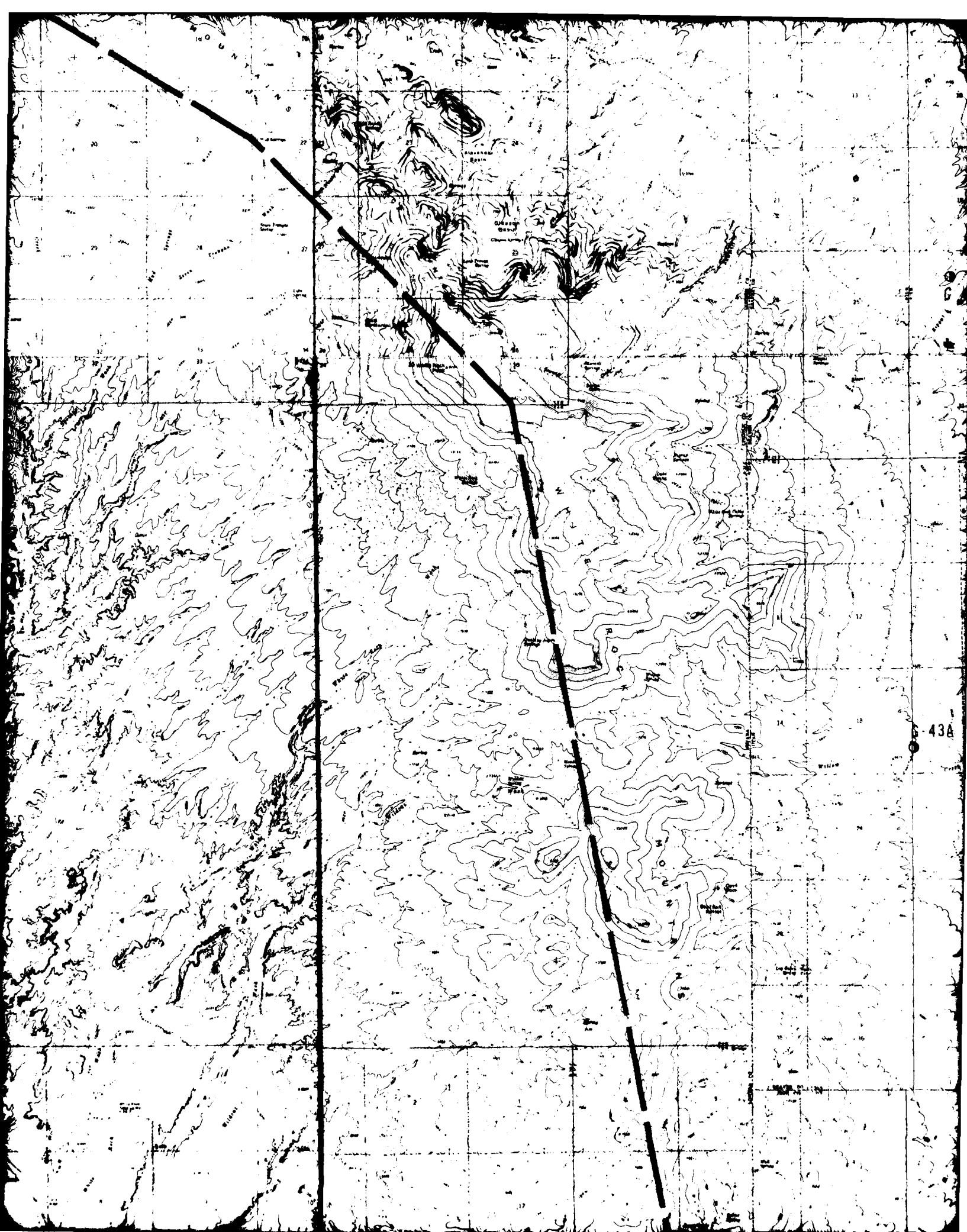
**Table Mountain**











G-38A

G-41A

G-42A

G-40A

G-20C

43A

G-2C

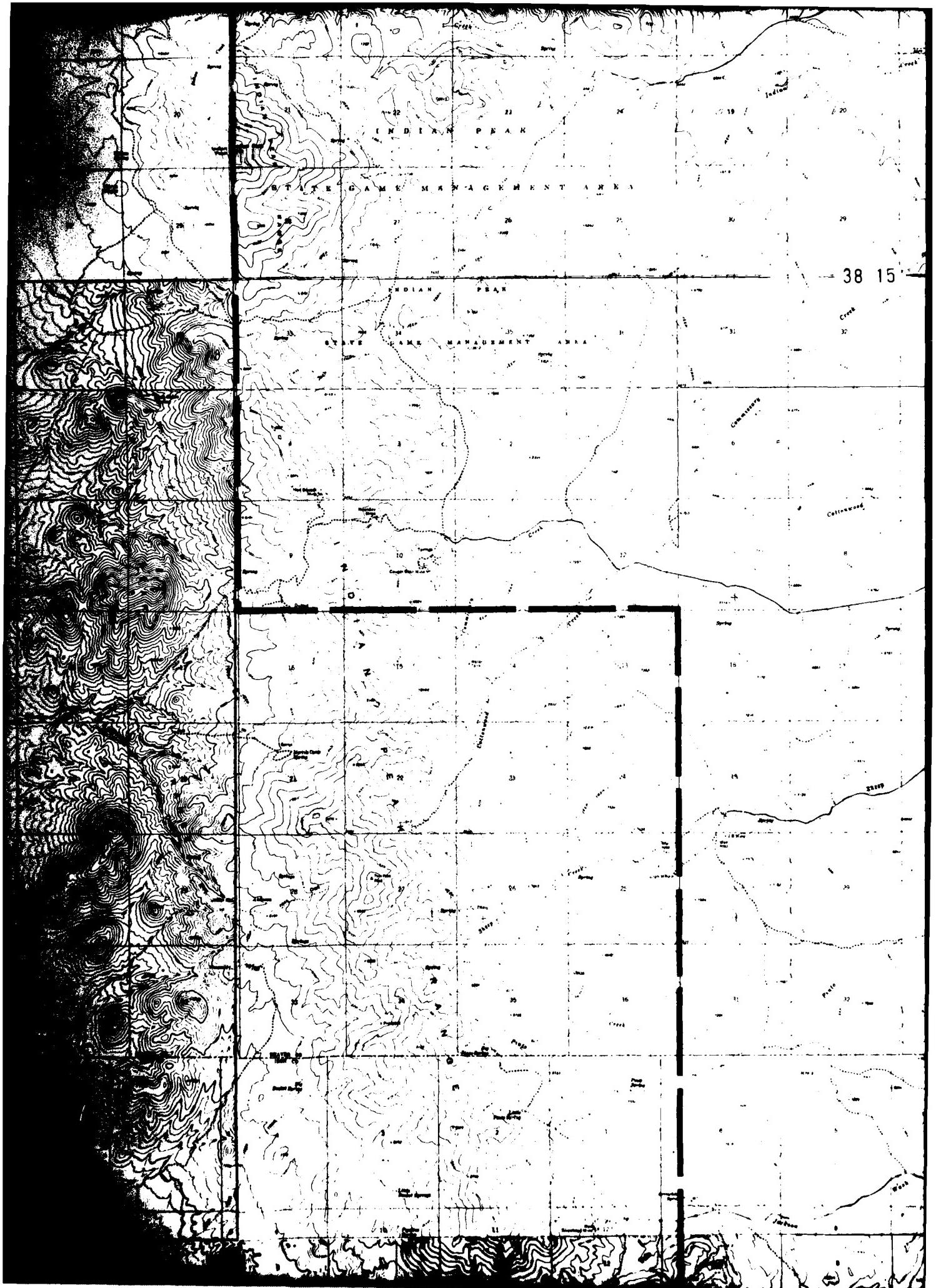
G-22C

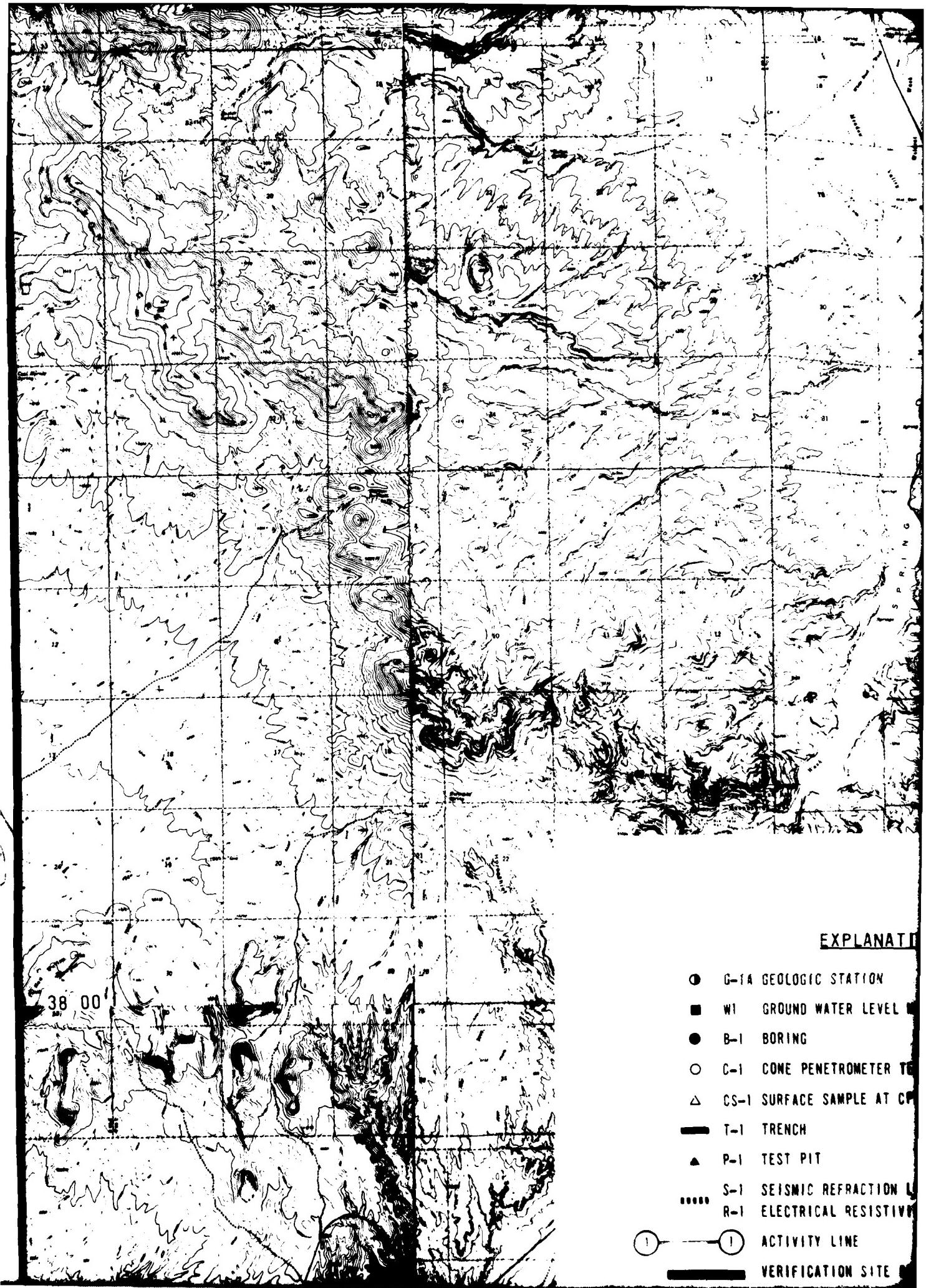
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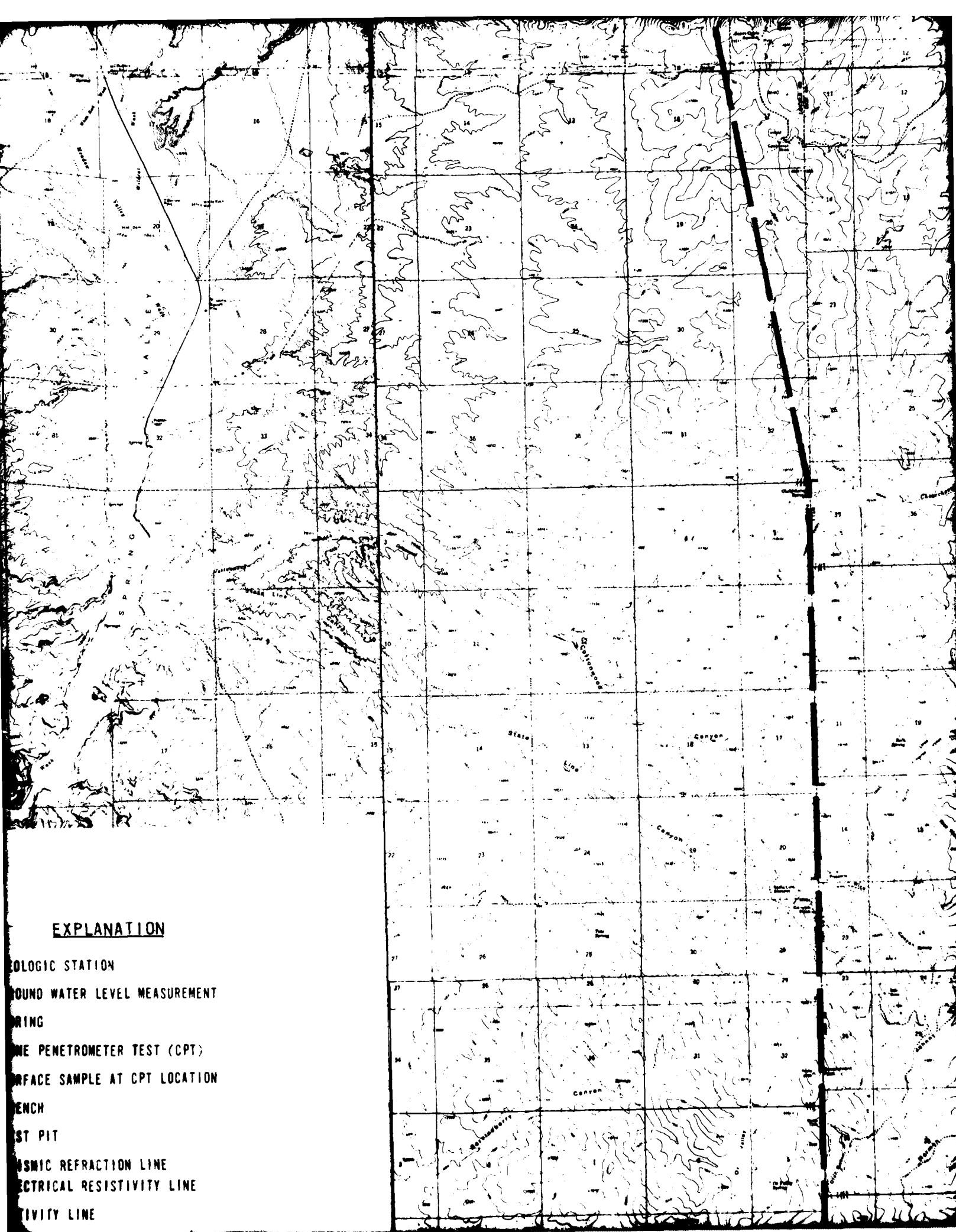
G-19C

G-18C

G-23C







#### EXPLANATION

- GEOLOGIC STATION
- GROUND WATER LEVEL MEASUREMENT
- SPRING
- cone PENETROMETER TEST (CPT)
- SURFACE SAMPLE AT CPT LOCATION
- DITCH
- TEST PIT
- SEISMIC REFRACTION LINE
- ELECTRICAL RESISTIVITY LINE
- GRAVITY LINE

G 23C

G-24C

G-25C

B-15C

W27

G-15C

W28

W29

G-17C

W30

G-8C

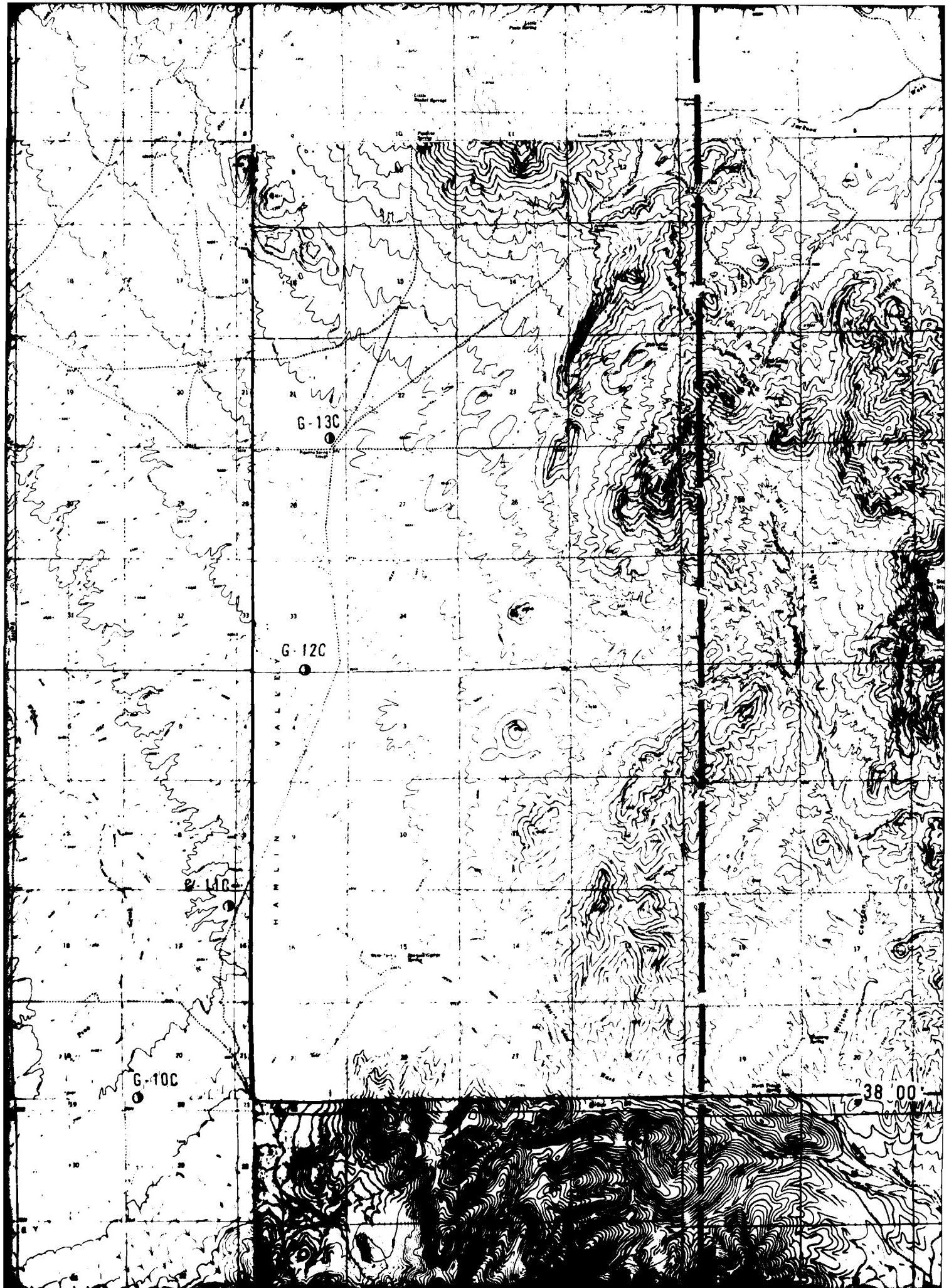
G-9C

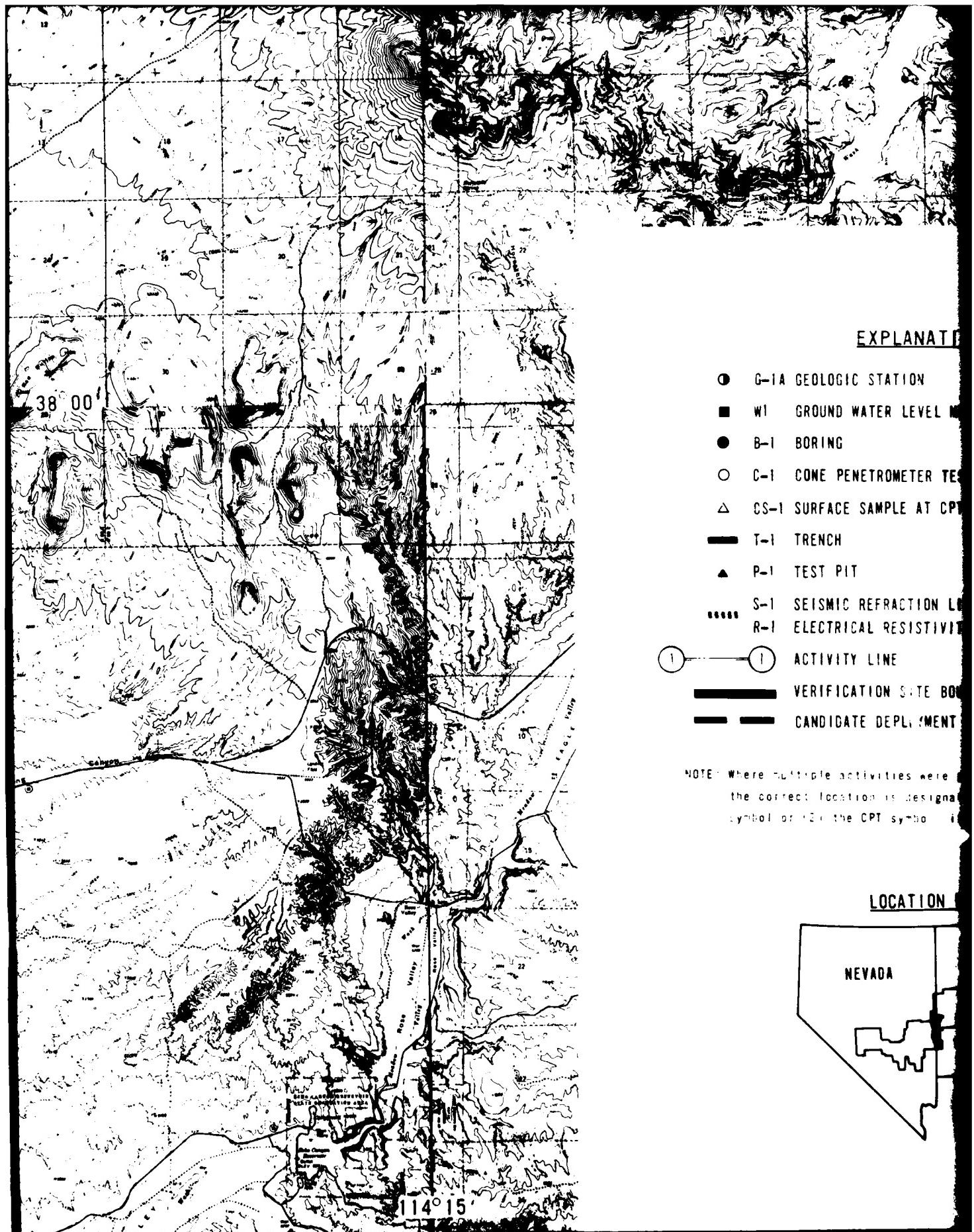
W31

G-7C

HARLIN

VALLEY



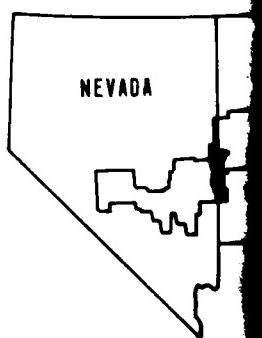


#### EXPLANATION

- G-1A GEOLOGIC STATION
- WI GROUND WATER LEVEL
- B-1 BORING
- C-1 CONE PENETROMETER TEST
- △ CS-1 SURFACE SAMPLE AT CPT
- T-1 TRENCH
- ▲ P-1 TEST PIT
- ===== S-1 SEISMIC REFRACTION LINE
- ===== R-1 ELECTRICAL RESISTIVITY
- ACTIVITY LINE
- ===== VERIFICATION SITE BORDER
- — — CANDIDATE DEPLOYMENT

NOTE: Where multiple activities were located at the same location, the correct location is designated by the symbol or '2' in the CPT symbol.

#### LOCATION



EXPLANATION

LOCATION

LEVEL MEASUREMENT

PILOT METER TEST (CPT)

BOREHOLE AT CPT LOCATION

PILOT METER TRAVERSATION LINE  
RESISTIVITY LINE

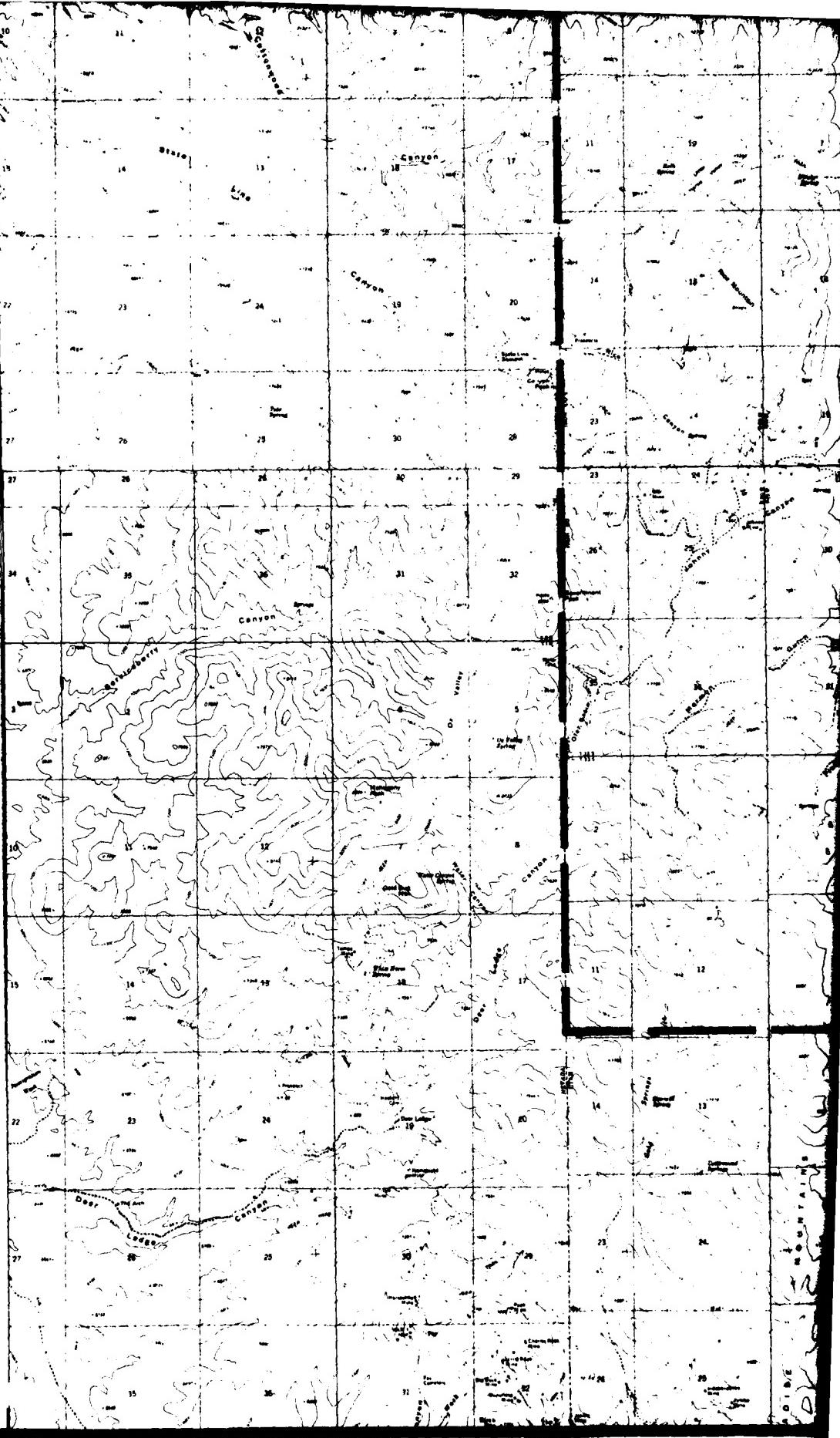
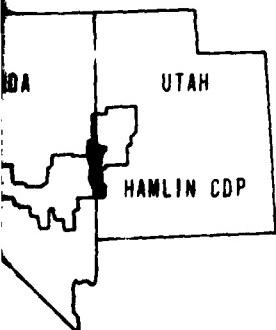
LINE

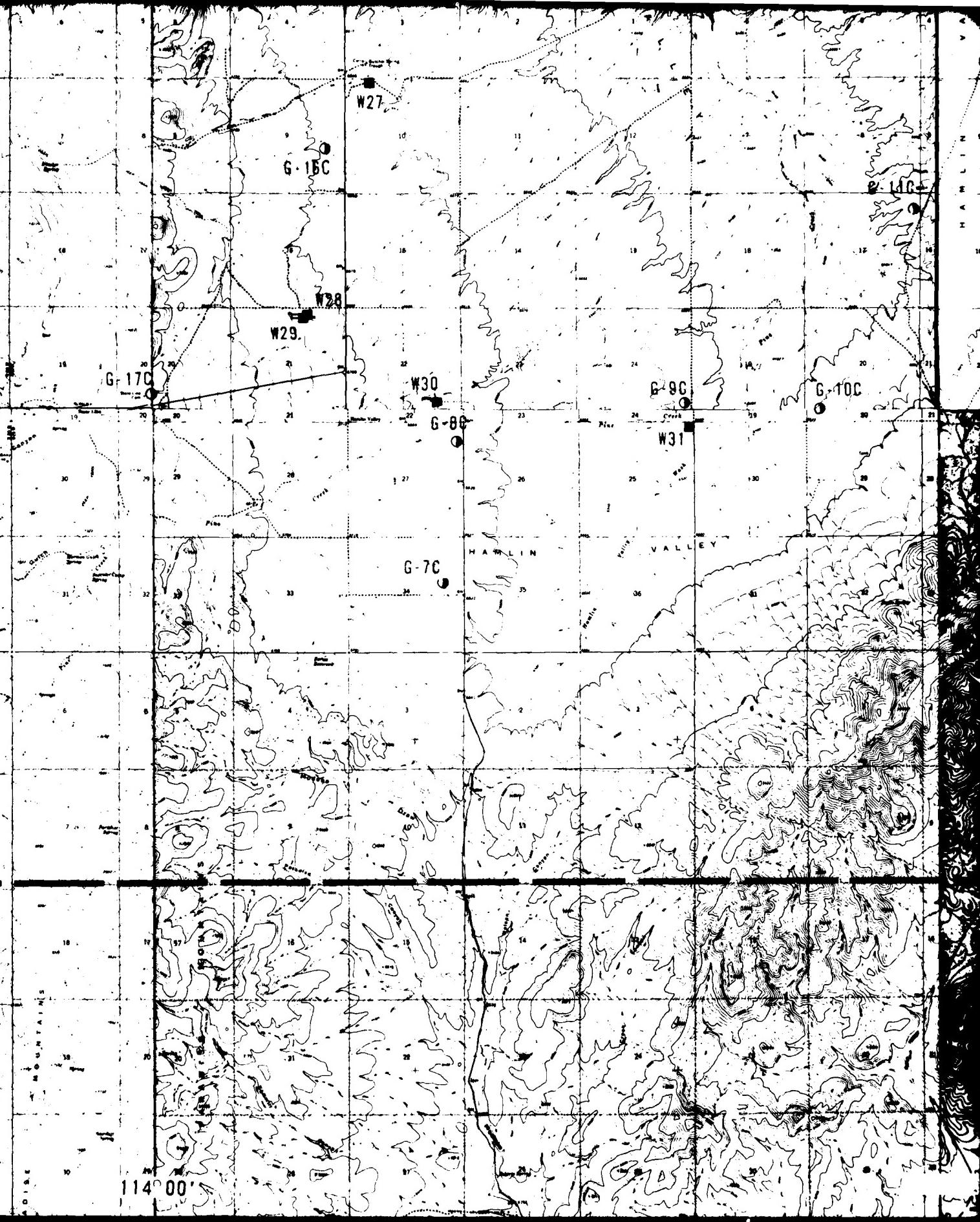
SITE BOUNDARY

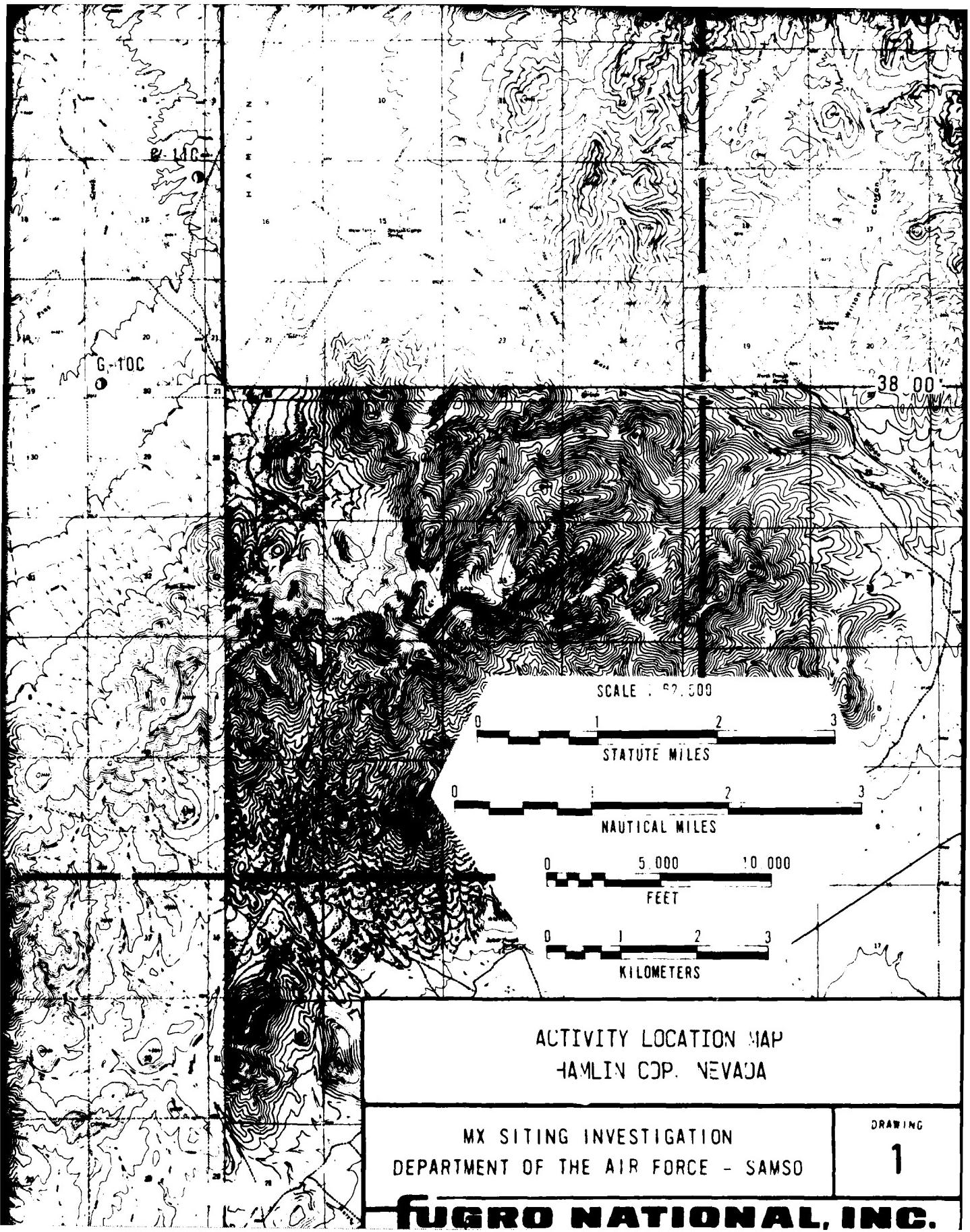
DEPLOYMENT PARCEL (CDP) BOUNDARY

Survey points were performed at the same location.  
A point is designated by either (1) the boring symbol or  
the symbol, if no boring was drilled.

LOCATION MAP







**FUGRO NATIONAL, INC.**

## CONE RESISTANCE

DEPTH

(METERS)

(FEET)

0 100 200 300 400 500 600 700 800 900 (

0 100 200 300 400 500 600 700 800 900 (



2

CONE RESISTANCE

900 ( $\text{kg}/\text{cm}^2$ )

900 (tsf)

80 (1664m)

T A40

80 (1686m)

T A5y

75 (1730m)

T A5y A5i

20 (1774m)

T A5i

80 (1814m)

T A5i

(1853m)

SOIL  
COLUMN

CS - 1

SM

P - 1

SM

GM

T - 1

SM

GM

B - 1

SM

SP -  
SM

CS - 5

SM

GP

DEPTH

(METERS)

0

1

5

0

1

5

0

1

5

0

1

5

0

1

5

0

1

5

0

1

5

0

1

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0

1

5

0

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0 100 200 300 400 500 600 700

0 100 200 300 400 500 600 700

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C - 17 SURFACE SURFICI

C - 18 SURFACE SURFICI

C - 19 SURFACE SURFICI

C - 20 SURFACE SURFICI

C - 21 SURFACE SURFICI

C - 22 SURFACE SURFICI

AD-A113 326

FUGRO NATIONAL INC .LONG BEACH CA  
MX SITING INVESTIGATION. GEOTECHNICAL EVALUATION. VOLUME IV. NE--ETC(U)  
AUG 79  
FN-TR-27-VOL-4

F/G 8/12

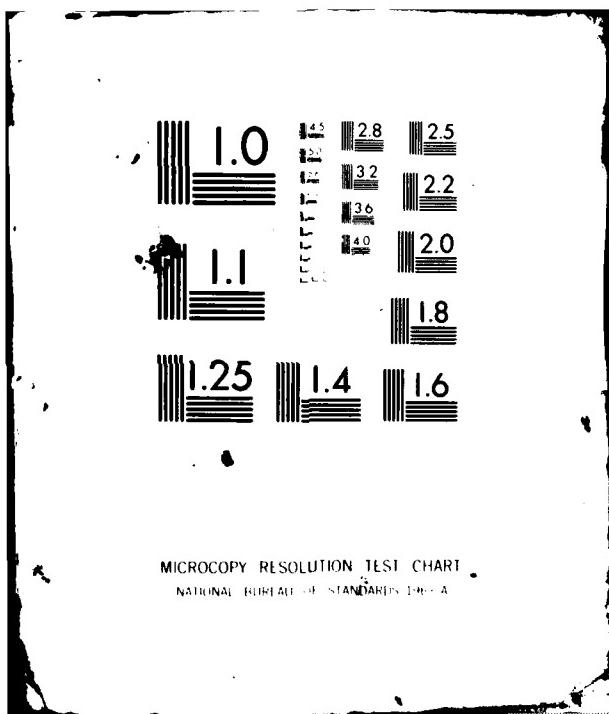
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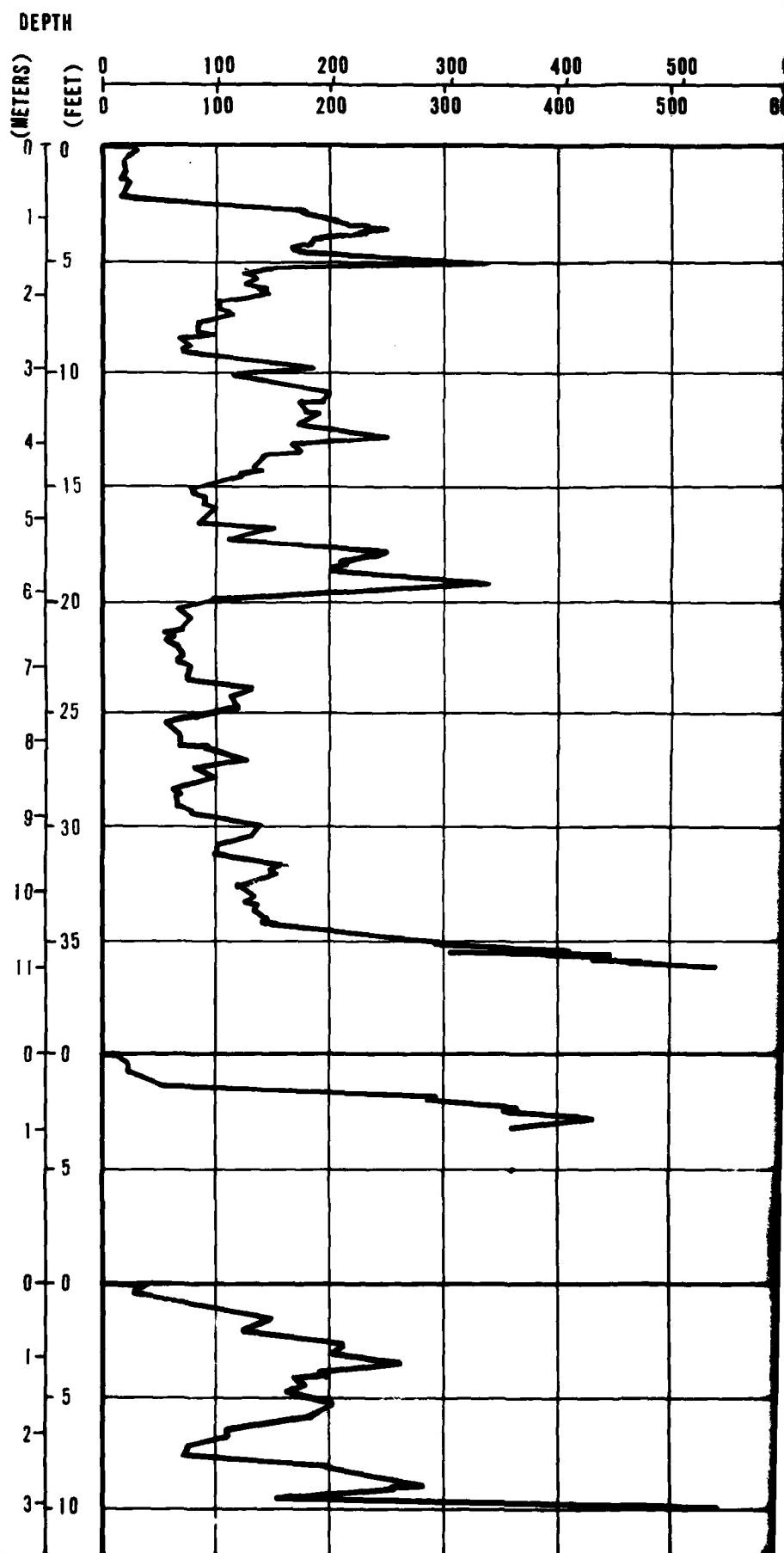
UNCLASSIFIED

3 - 3  
4 - 4  
5 - 5

END  
DATE  
FILED  
5-82  
DTIG

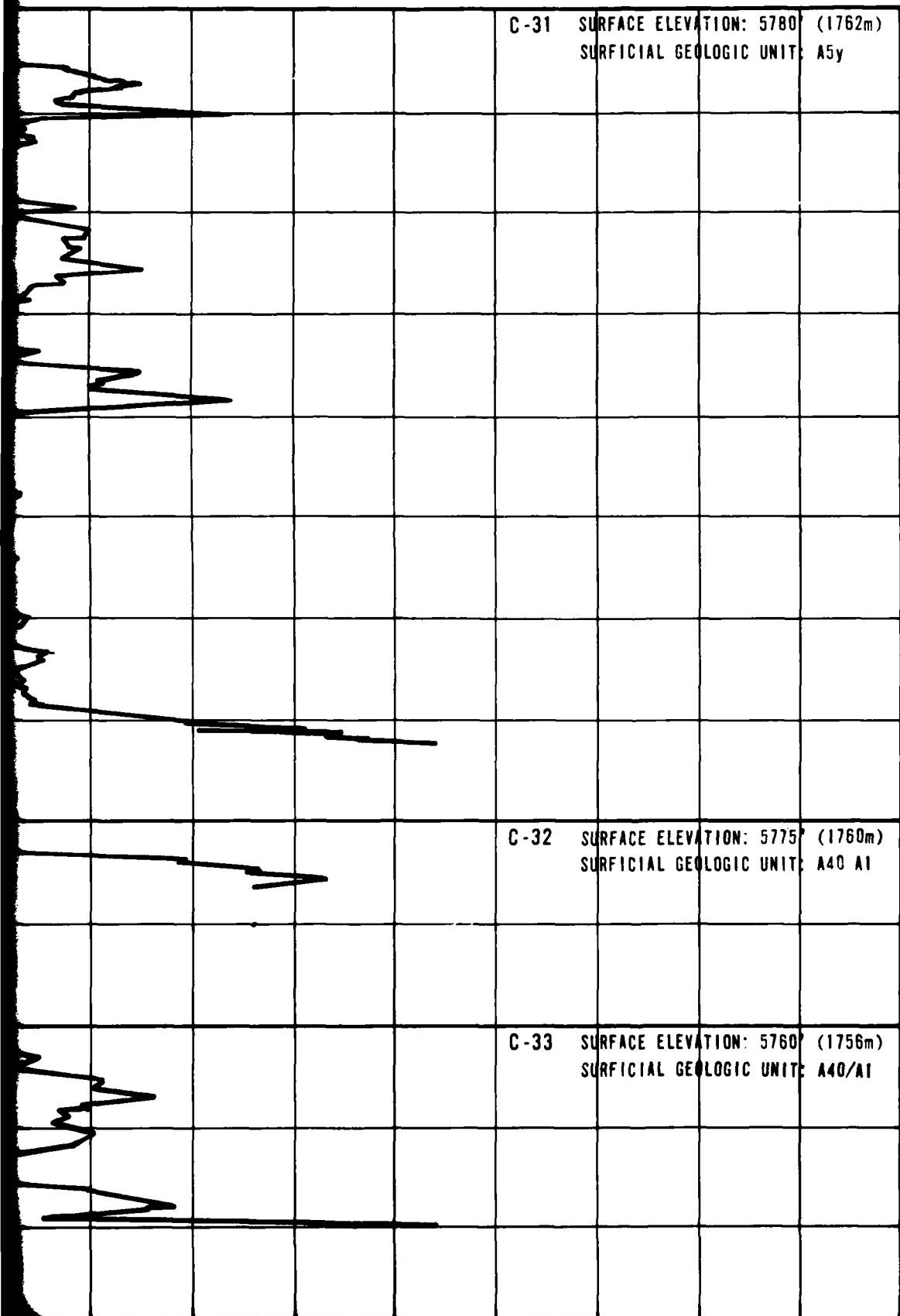


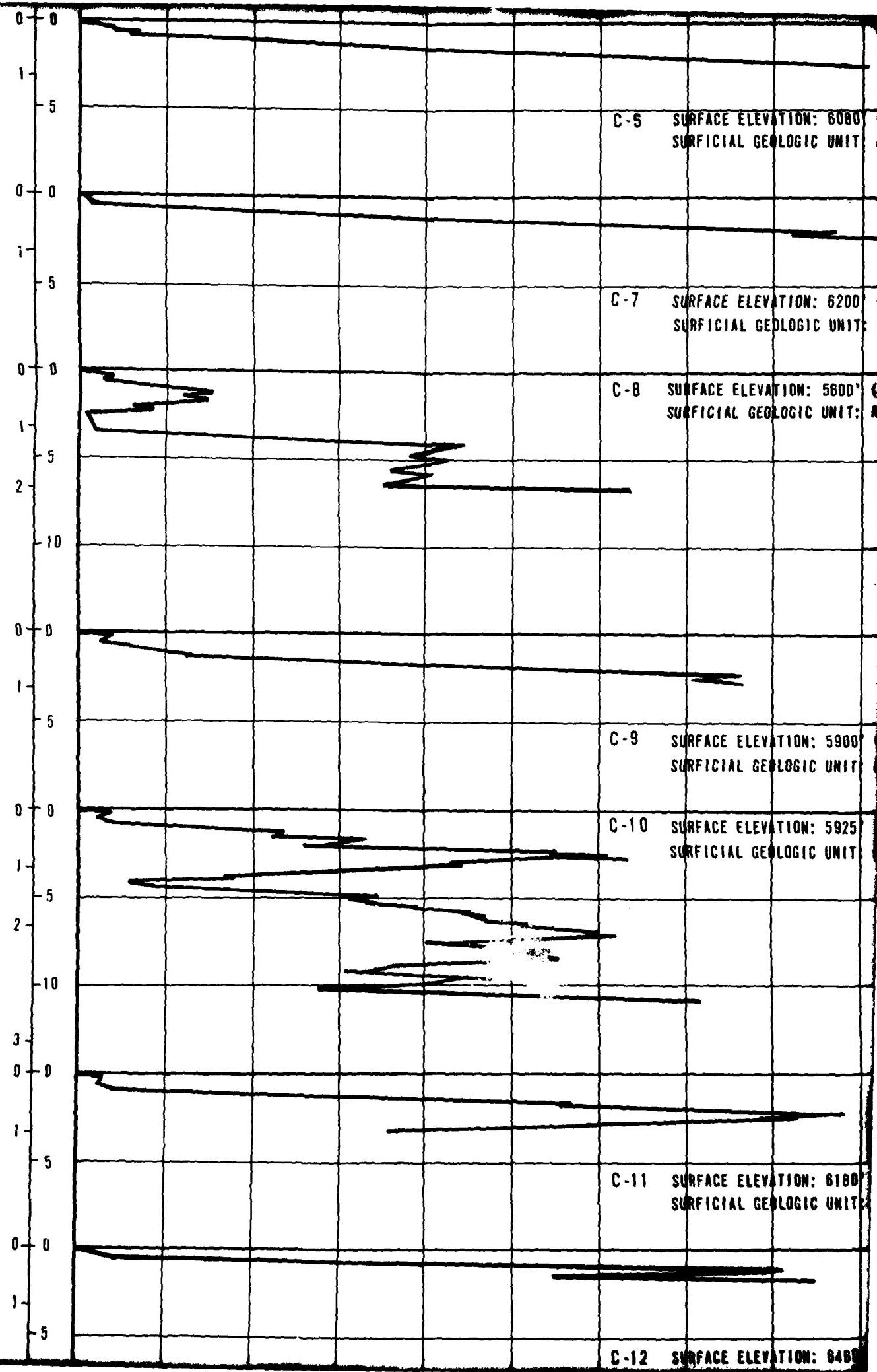
## CONE RESISTANCE



## CONE RESISTANCE

200 300 400 500 600 700 800 900 (kg/cm<sup>2</sup>)  
200 300 400 500 600 700 800 900 (tsf)





LEVATION: 6080' (1853m)  
GEOLOGIC UNIT: A5i

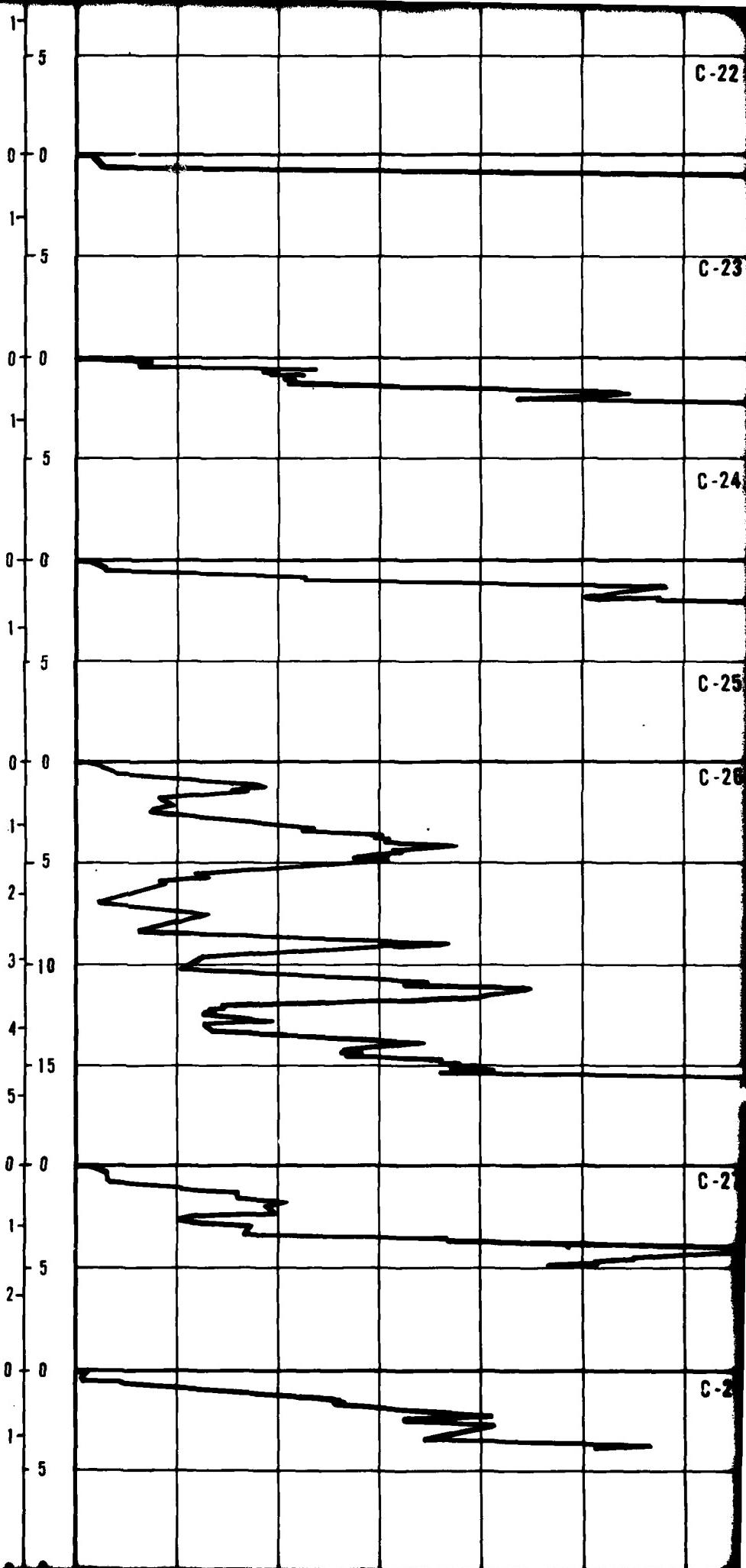
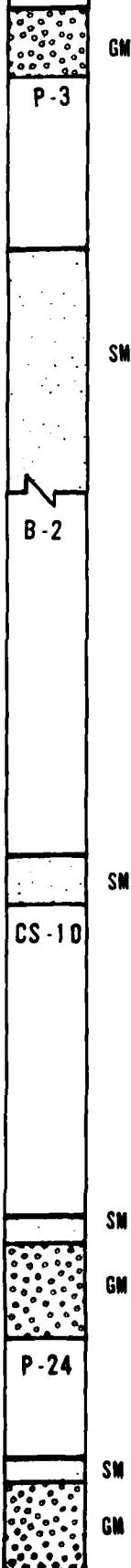
LEVATION: 6200' (1890m)  
GEOLOGIC UNIT: A5i

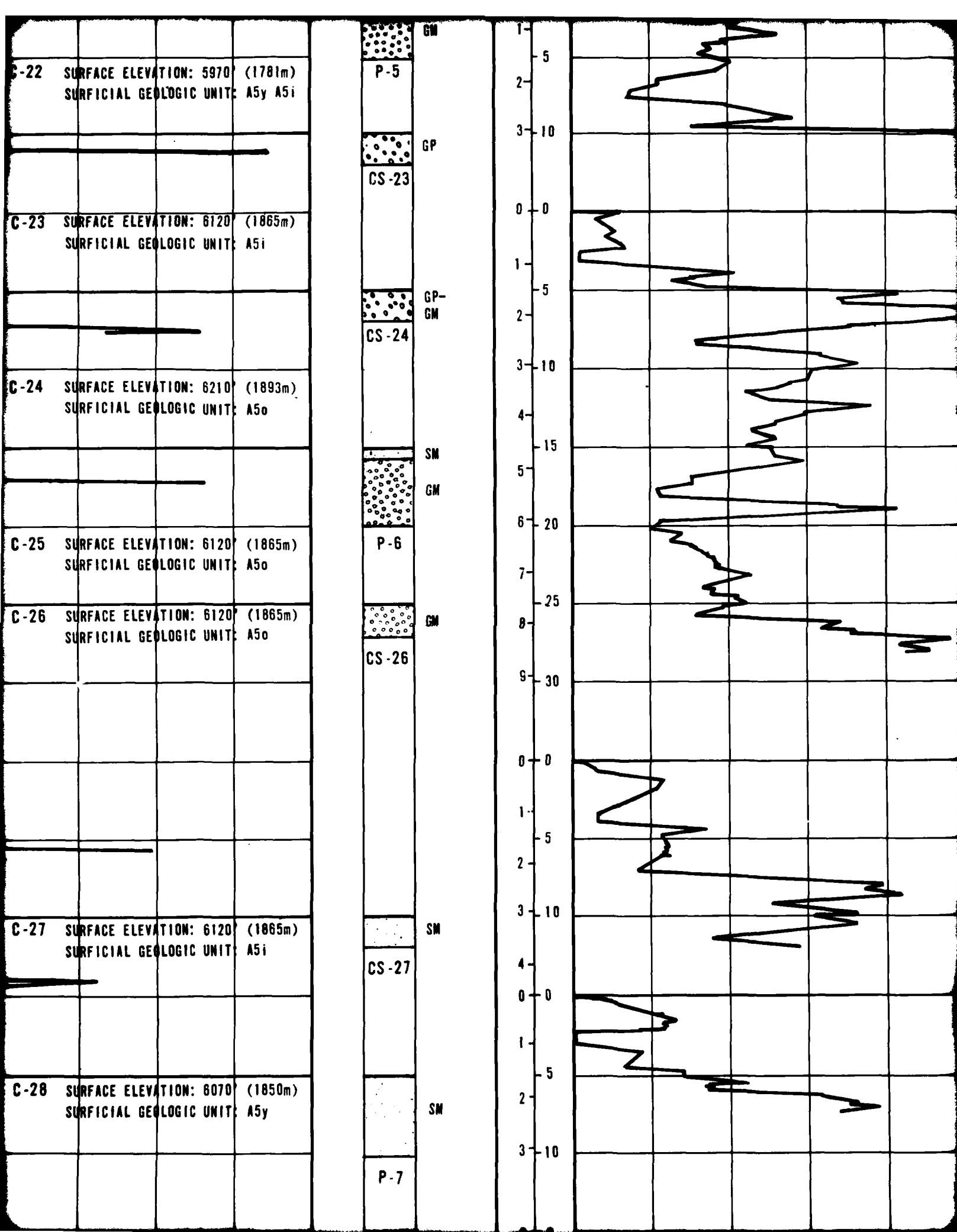
LEVATION: 5600' (1707m)  
GEOLOGIC UNIT: A5i

LEVATION: 5900' (1798m)  
GEOLOGIC UNIT: A5i

LEVATION: 5925' (1806m)  
GEOLOGIC UNIT: A5y/A5i

LEVATION: 6180' (1884m)  
GEOLOGIC UNIT: A5i





SURFICIAL GEOLOGIC UNIT: A40/A1

SM

P 19

CL

GM

P-18

SM

CS-35

SM

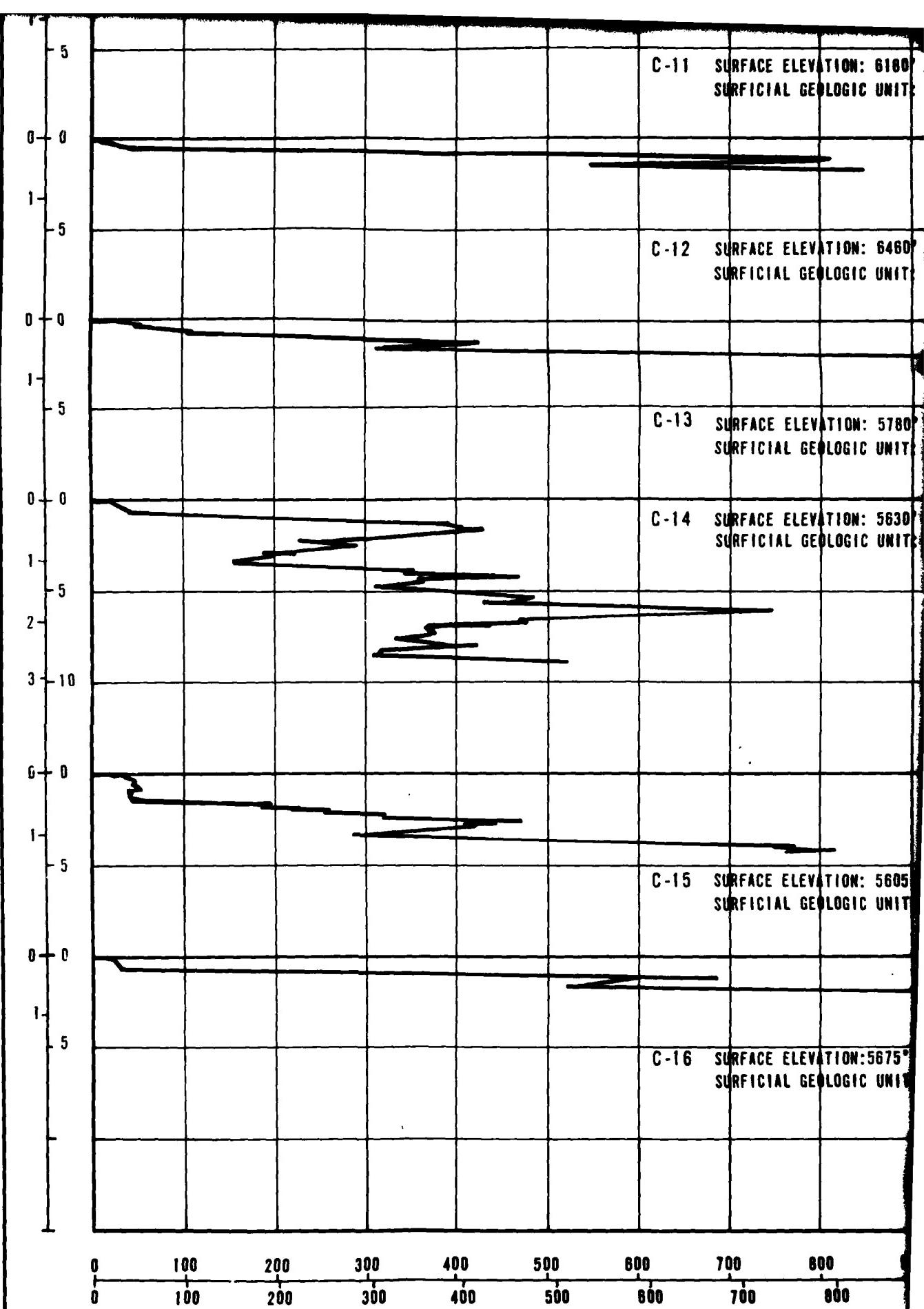
C-34 SURFACE ELEVATION: 5765' (1757m)  
SURFICIAL GEOLOGIC UNIT: A40 A1

C-35 SURFACE ELEVATION: 5780' (1762m)  
SURFICIAL GEOLOGIC UNIT: A40 A1

C-36 SURFACE ELEVATION: 5780' (1762m)  
SURFICIAL GEOLOGIC UNIT: A51 A40

P-17

APPROVED BY \_\_\_\_\_  
SIGNED BY \_\_\_\_\_



2 JUL 79

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C-28 SURFACE ELEVATION: 6070 (1850m)  
SURFICIAL GEOLOGIC UNIT: A5y

C-29 SURFACE ELEVATION: 5785 (1763m)  
SURFICIAL GEOLOGIC UNIT: A5y A5i

C-30 SURFACE ELEVATION: 5860 (1786m)  
SURFICIAL GEOLOGIC UNIT: A5i

SM

P-7

GM

SM

B-4

SM

GM

P-21

5

2

3-10

0-0

1-5

2

3-10

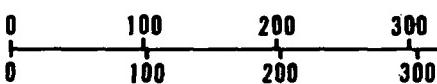
0-0

1

-5

-1

-5



500 600 700 800 900 (tsf)

500 600 700 800 900 ( $\text{kg}/\text{cm}^2$ )

P-17

SM  
GP

CS-37

SM  
GP

CS-38

C-37 SURFACE ELEVATION: 5830 (1767m)  
SURFICIAL GEOLOGIC UNIT: A5y

C-38 SURFACE ELEVATION: 5980 (1823m)  
SURFICIAL GEOLOGIC UNIT: A5i A5y

200 300 400 500 600 700 800 900 (tsf)  
200 300 400 500 600 700 800 900 ( $\text{kg}/\text{cm}^2$ )

CONE PENETROMETER TEST RESULTS  
VERIFICATION SITE  
HAMLIN CDP. NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

DRAWING  
2  
1 OF 2

**FUGRO NATIONAL, INC.**

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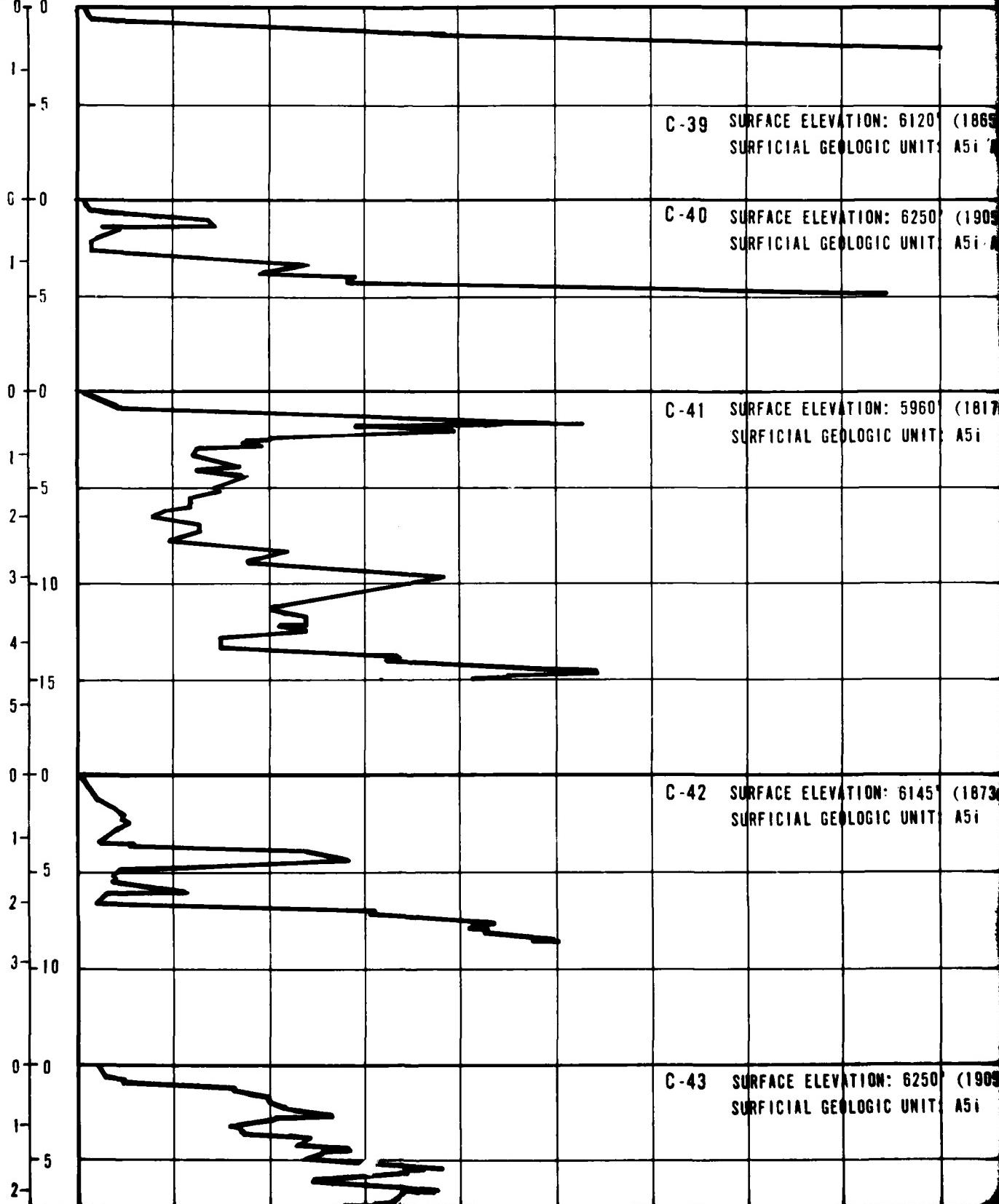
## CONE RESISTANCE

DEPTH

(METERS)  
(FEET)

0 100 200 300 400 500 600 700 800 900

0 100 200 300 400 500 600 700 800 900



2

CONE RESISTANCE

900 ( $\text{kg}/\text{cm}^2$ )

900 (tsf)

SOIL  
COLUMN

DEPTH

(METERS)  
(FEET)

0 100 200 300 400 500 600 700

0 100 200 300 400 500 600 700

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0 100 200 300 400 500 600 700

6120 (1865m)  
UNIT A5i A5v

6250 (1905m)  
UNIT A5i A5y

5960 (1817m,  
UNIT A5i

6145 (1873m)  
UNIT A5i

6250 (1905m)  
UNIT A5i

SM

P-15

SM

SP-SM

T-6

SM

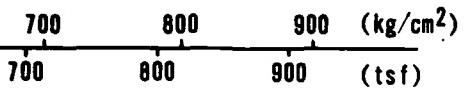
P-16

C-50 SURFA  
SURFI

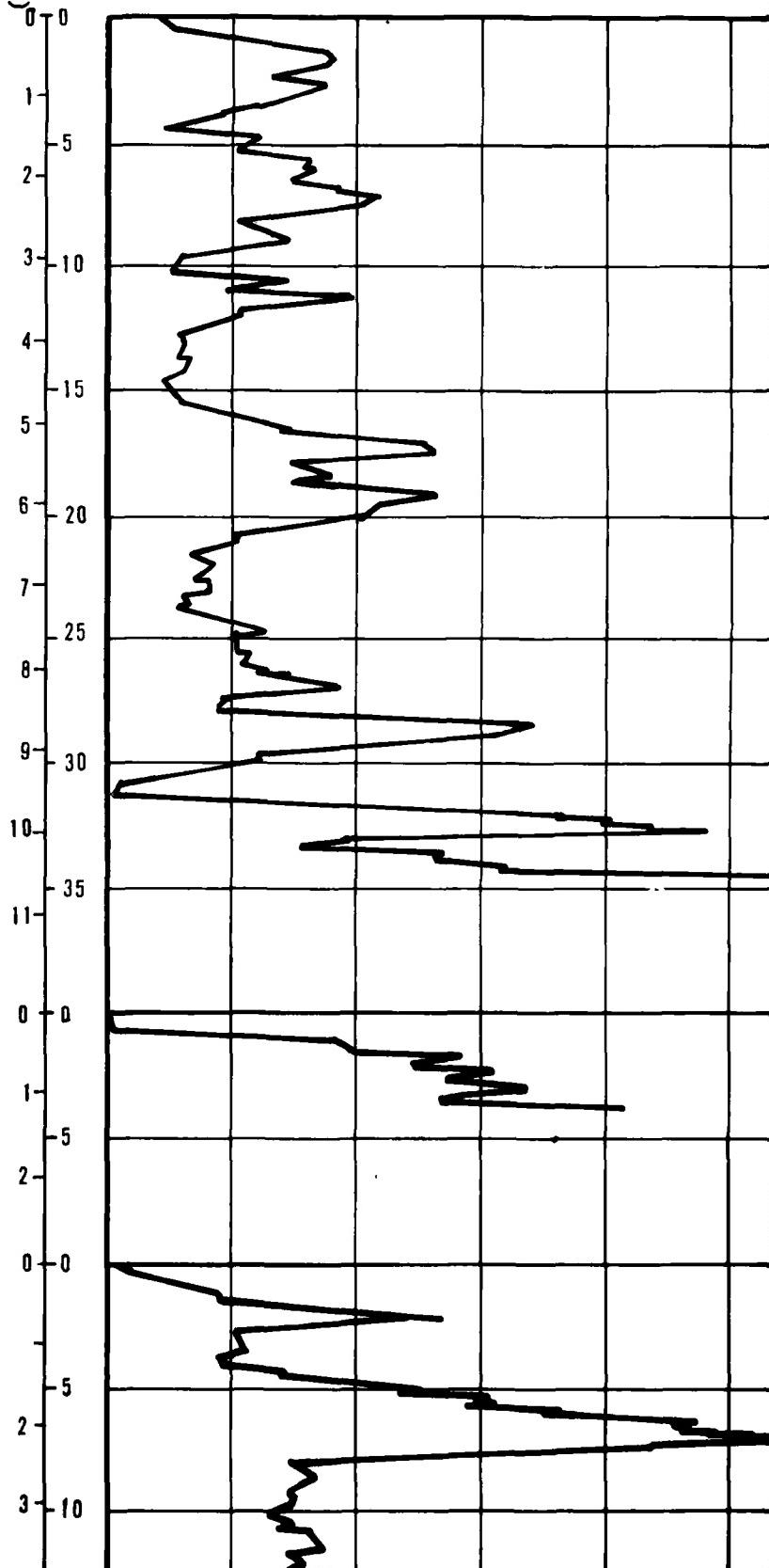
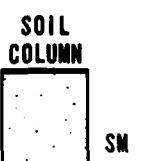
C-51 SURFA  
SURFI

3

## CONE RESIS



SURFACE ELEVATION: 6065' (1849m)  
SURFICIAL GEOLOGIC UNIT: A5i A4o



## CONE RESISTANCE

200 300 400 500 600 700 800 900 ( $\text{kg}/\text{cm}^2$ )  
200 300 400 500 600 700 800 900 (tsf)

C-58 SURFACE ELEVATION: 5945' (1812m)  
SURFICIAL GEOLOGIC UNIT: A5i A40

SOIL  
COLUMN

SM

CL

ML

SM

B-5

CL, ML

CL

P-9

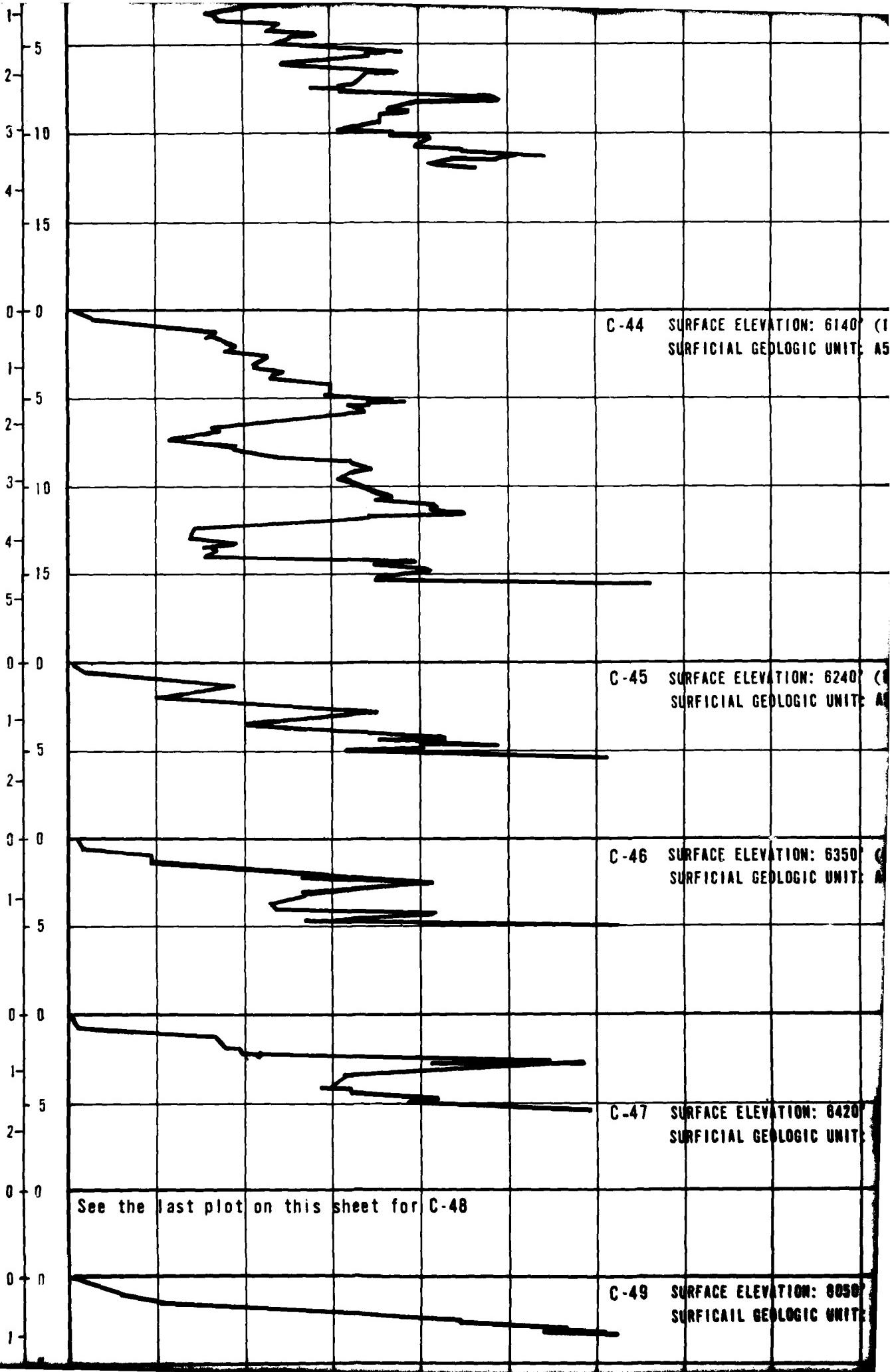
SC

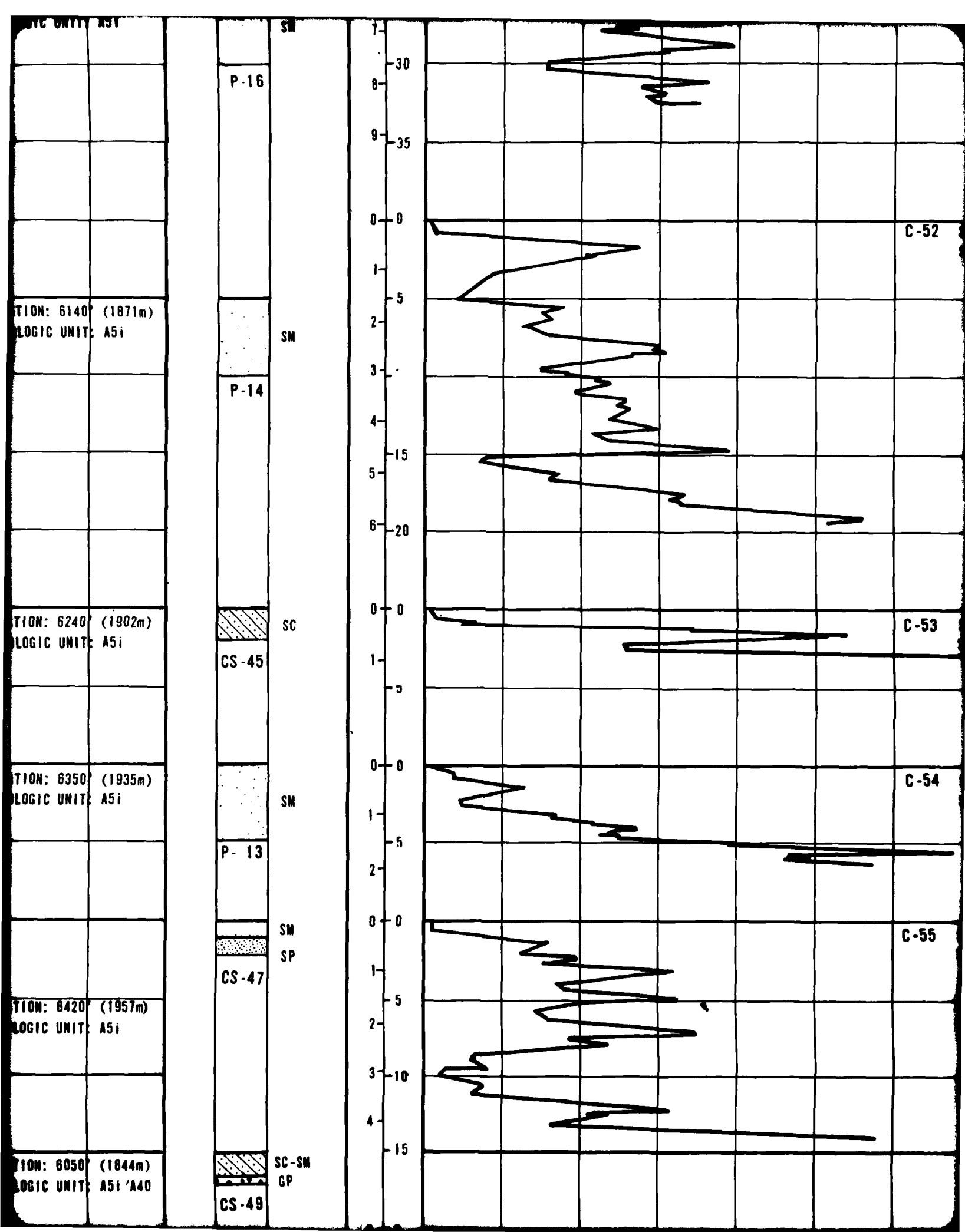
SM

P-10

C-59 SURFACE ELEVATION: 5920' (1804m)  
SURFICIAL GEOLOGIC UNIT: A5i A40

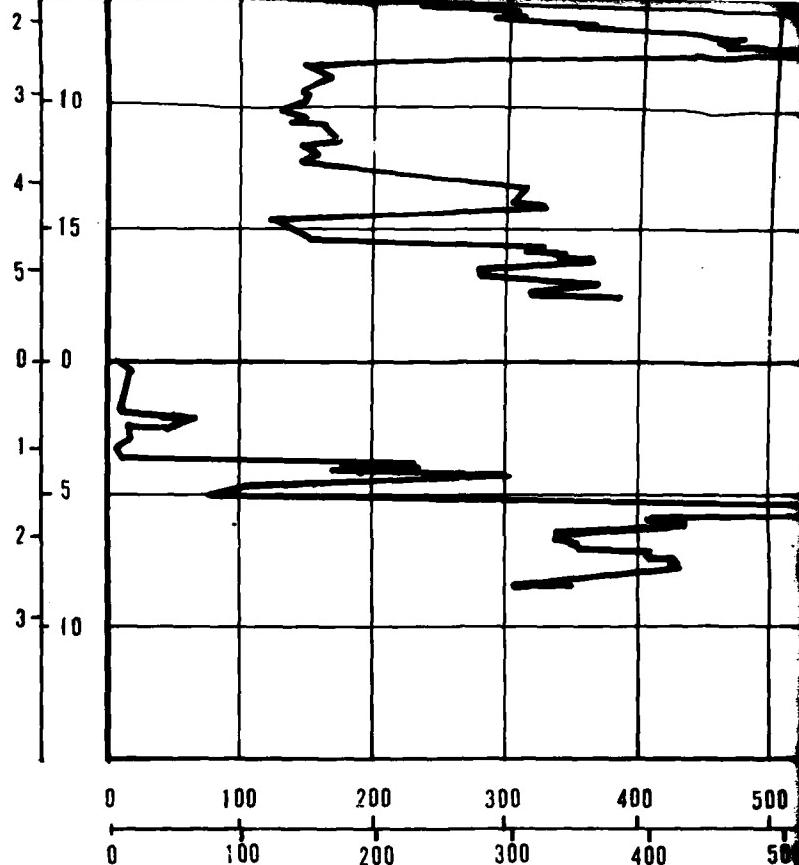
C-60 SURFACE ELEVATION: 5905' (1800m)  
SURFICIAL GEOLOGIC UNIT: A5i A4p





52 SURFACE ELEVATION: 6160 (1878m)  
SURFICIAL GEOLOGIC UNIT: A5i A4o

SM  
CS-52



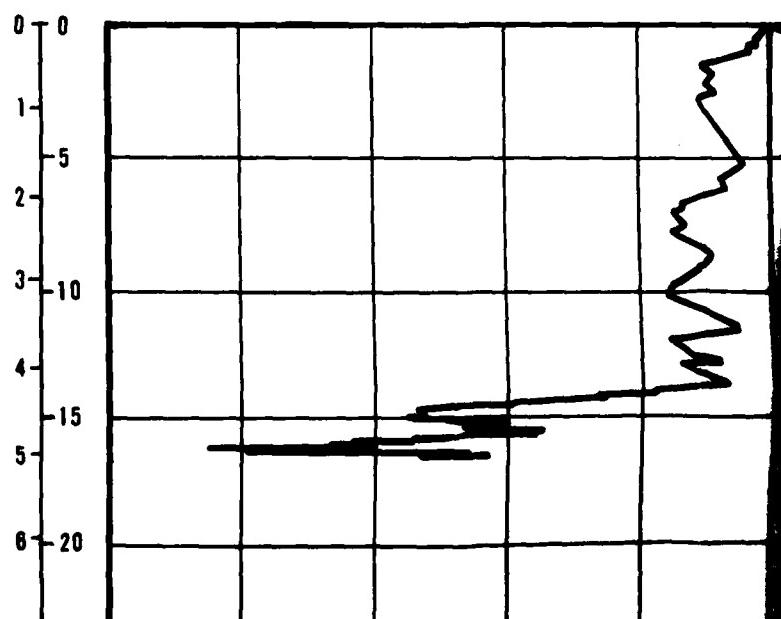
53 SURFACE ELEVATION: 6240 (1902m)  
SURFICIAL GEOLOGIC UNIT: A5i

SM  
T-5



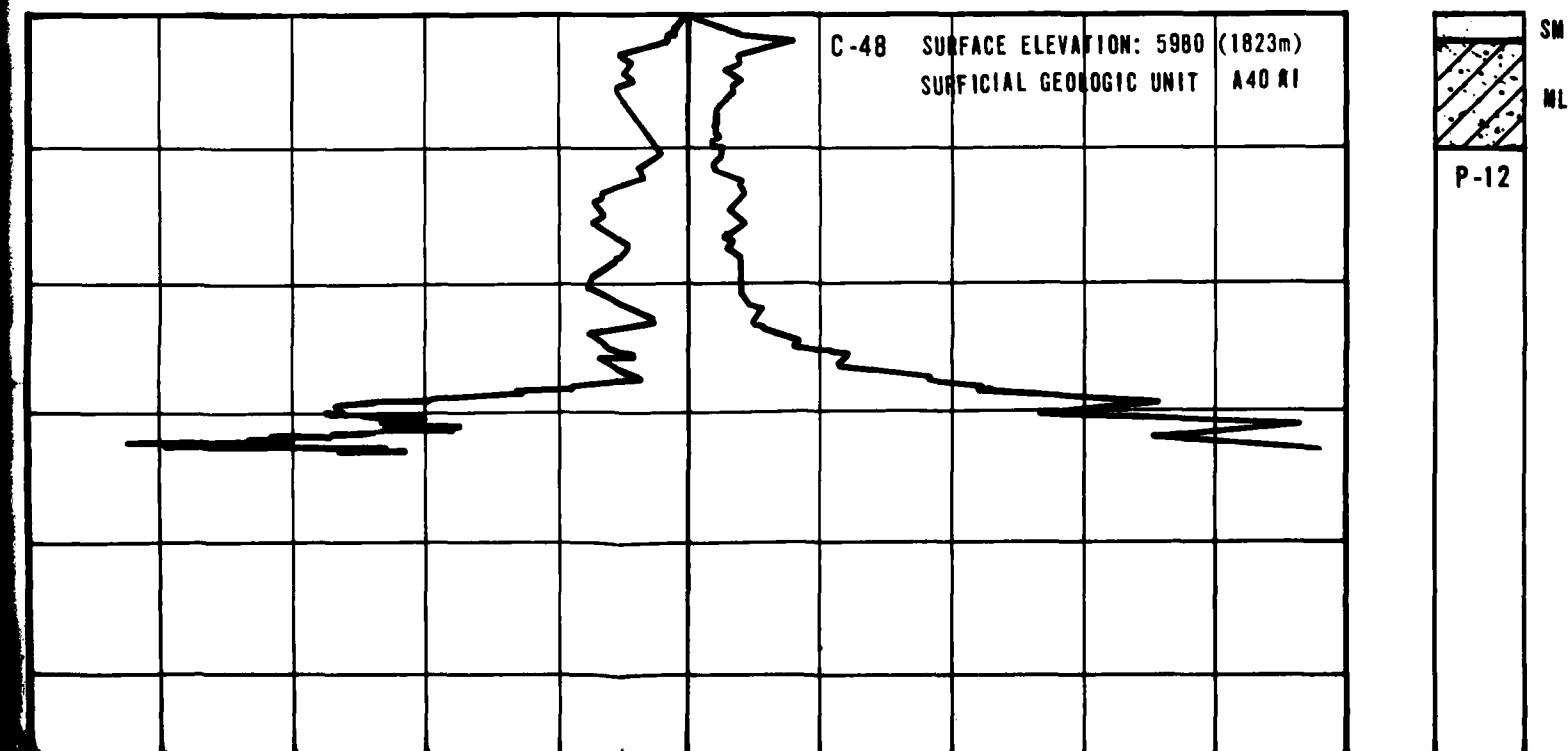
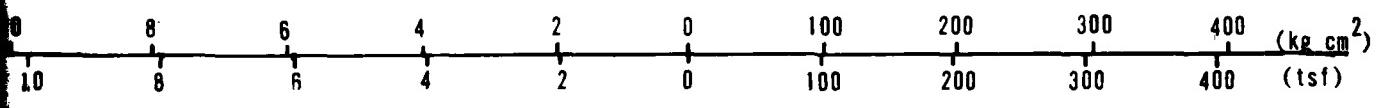
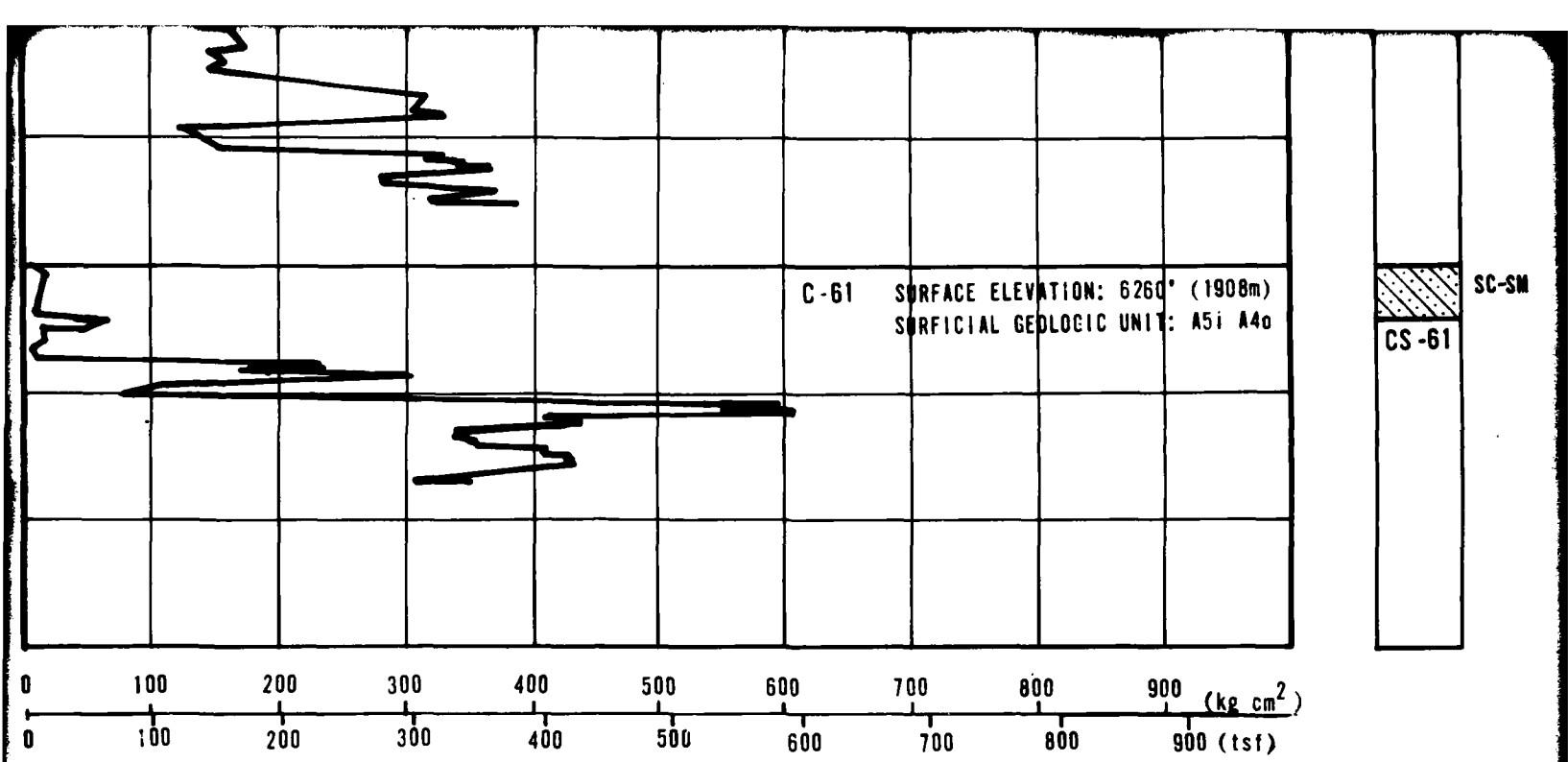
54 SURFACE ELEVATION: 6170 (1881m)  
SURFICIAL GEOLOGIC UNIT: A5i A4o

SM  
P-8



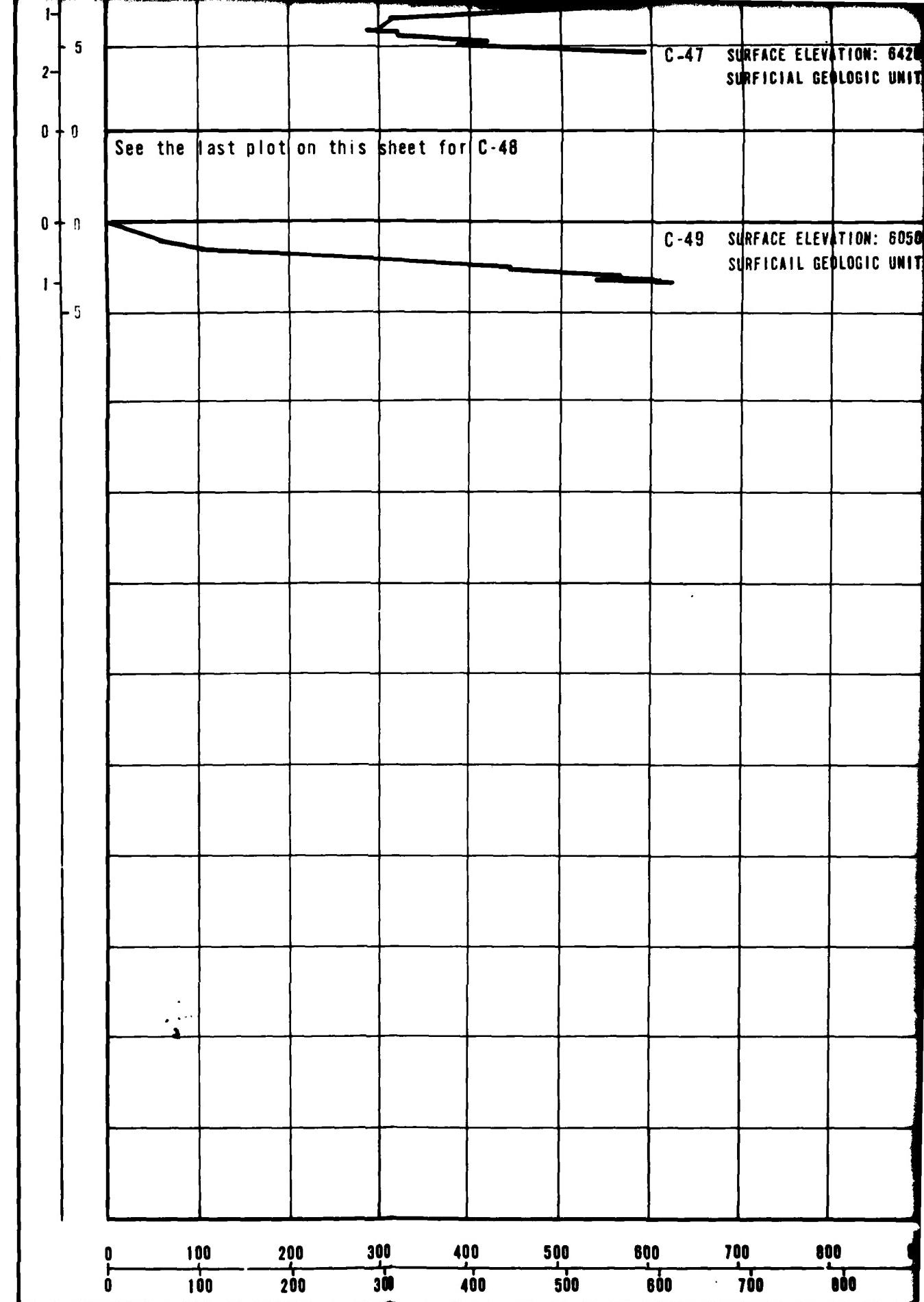
55 SURFACE ELEVATION: 6120 (1865m)  
SURFICIAL GEOLOGIC UNIT: A5i A4o

SM  
CS-55



APPROVED BY \_\_\_\_\_

CHECDED BY \_\_\_\_\_



2 JUL 79

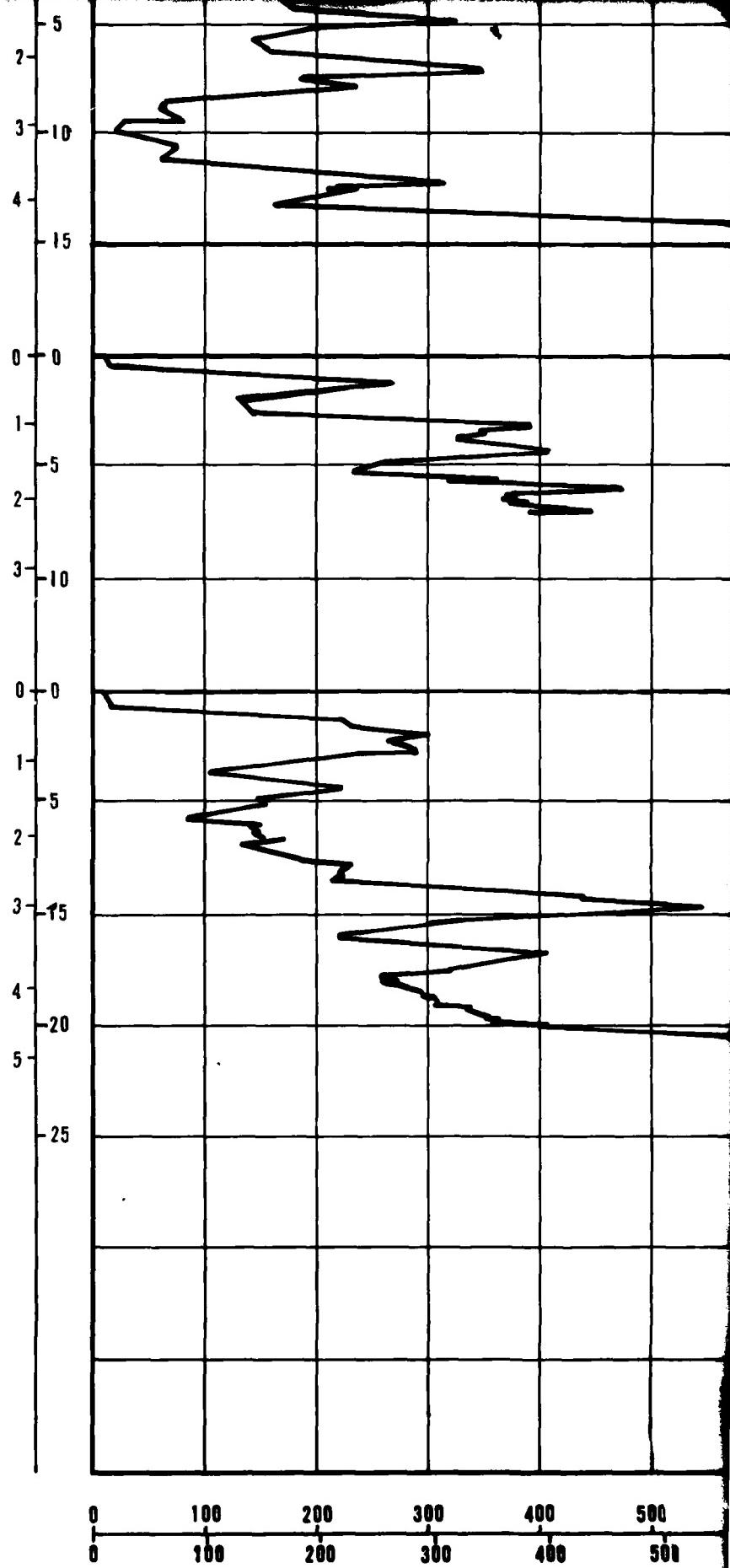
D

SURFACE ELEVATION: 6420' (1957m)  
SUPERFICIAL GEOLOGIC UNIT: A5i

SURFACE ELEVATION: 6050' (1844m)  
SUPERFICIAL GEOLOGIC UNIT: A5i/A40

SC-SM  
GP  
CS-49

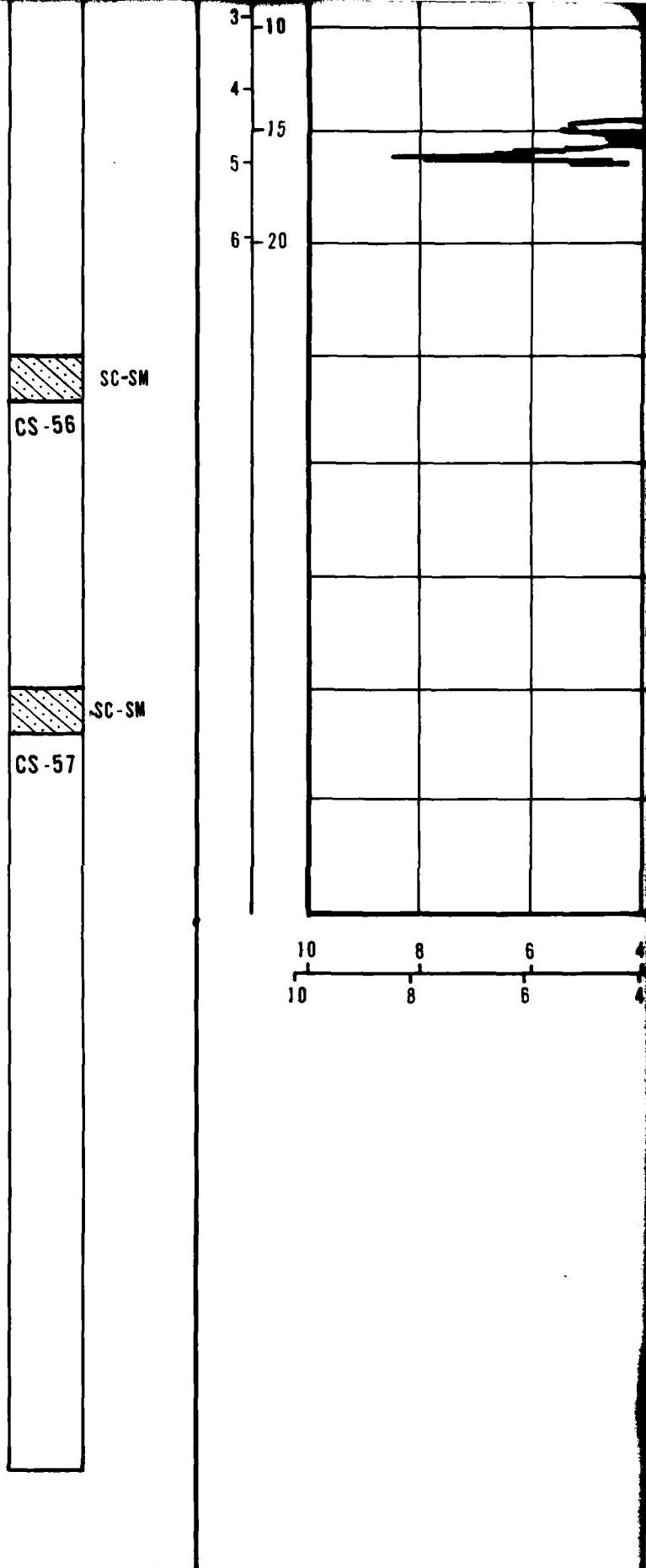
700 800 900 (tsf)  
700 800 900 ( $\text{kg}/\text{cm}^2$ )

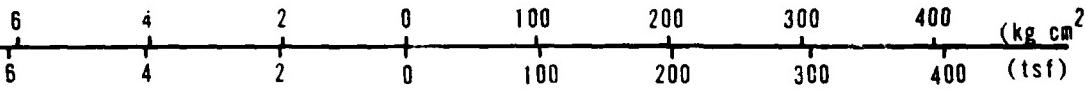


C-56 SURFACE ELEVATION: 6060' (1847m)  
SURFICIAL GEOLOGIC UNIT: A5i A4o

C-57 SURFACE ELEVATION: 6010' (1832m)  
SURFICIAL GEOLOGIC UNIT: A5i A4o

500 600 700 800 900 (tsf)  
500 600 700 800 900 ( $\text{kg}/\text{cm}^2$ )





CONE PENETROMETER TEST RESULTS  
VERIFICATION SITE  
HAMLIN CDP. NEVADA

MX SITING INVESTIGATION  
DEPARTMENT OF THE AIR FORCE - SAMSO

DRAWING  
2  
2 OF 2

**FUGRO NATIONAL, INC.**

